Expert Advisory Groups: Exploring the Sensemaking Process During a Public Health Crisis Response

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Abstract

Crisis sensemaking research has focused mainly on acute crises such as wildfires or industrial accidents, with crisis response being approximately under 72 hours. However, there is limited research on long duration crisis sensemaking for crisis response that may be several weeks, months, or even years. This research study aims to explore long duration crisis sensemaking during a public health crisis.

During the crisis response period, key decision makers (KDMs) face a plethora of challenges, including being inundated with information, with varying levels of quality and relevance, or not having the right kind of information. They may rely on an Expert Advisory Group (EAG) to advise on the scientific/medical aspect of the disease. The EAG is comprised of specialists such as infectious disease physicians, infection prevention and control practitioners, epidemiologists, and public health physicians.

The 2003 SARS outbreak in Toronto, Canada, was the context for this research. Participants were recruited who served as members of the Ontario SARS Scientific Advisory Committee (OSSAC) or were stakeholders during the crisis. Among their duties, these experts were tasked to write directives (mandated protocols) that govern all aspects of hospital life, from patient transfers, to cleaning. Data was collected in multiple forms, including: public inquiry reports, meeting minutes, newspaper articles, and interviews. Following a constructivist grounded theory strategy, I conducted several iterations of data collection and analysis.

The findings include a conceptual framework of EAG social sensemaking through a long duration crisis, depicting the sequential process of a stream of sensemaking (the creation and revision of one directive). A second conceptual framework on the information dynamics of long duration social sensemaking reflects the learning over the course of the crisis period. Finally, a third conceptual framework on the regulation of expert advisory group sensemaking as a balance between the knowns and unknowns in the greater health system is presented.

Acknowledgements

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Table of Contents

List of Tables

List of Figures

List of Acronyms

This is not an exhaustive list of all the acronyms in this thesis.

EAG	Expert Advisory Group
GTM	Grounded Theory Method
HCWs	Health Care Workers
IPAC	Infection Prevention and Control
KDMs	Key Decision-Makers
MCSCS	Ministry of Community Safety & Correctional Services
MoHLTC	Ministry of Health and Long-Term Care
OSSAC	Ontario SARS Scientific Advisory Committee
PAPRs	Powered Air Purifying Respirators
POC	Provincial Operations Centre
PPE	Personal Protective Equipment
PSM	Prospective Sensemaking
RSM	Retrospective Sensemaking
SARS	Severe Acute Respiratory Syndrome

Chapter 1: Introduction

Vignette

A doctor, incubating a deadly virus, arrives from China and stays one night at the Metropole hotel in Hong Kong on February 21, 2003. He is there to attend a wedding, but never makes it. In the morning he feels extremely ill and walks to a nearby hospital. In China, he had been treating patients with atypical pneumonia, but he insists to the hospital administration that his illness is different. He was wrong - he dies in the hospital, on March 4, 2003. During that one-night stay at the hotel, he transmits the virus he is carrying to a minimum of 17 other people. These people incubate the virus as they travel to various destinations around the world, including Toronto, Canada. In Figure 1.1 below, the doctor from China is in the green room; the people he transmits the virus to are in blue rooms. The area which is tested positive for traces of the virus are in the red area (Braden, Dowell, Jernigan, & Hughes, 2013). From March to July 2003, Canadians were fighting this deadly, emerging infectious disease: Severe Acute Respiratory Syndrome (SARS) (WHO, 2006).

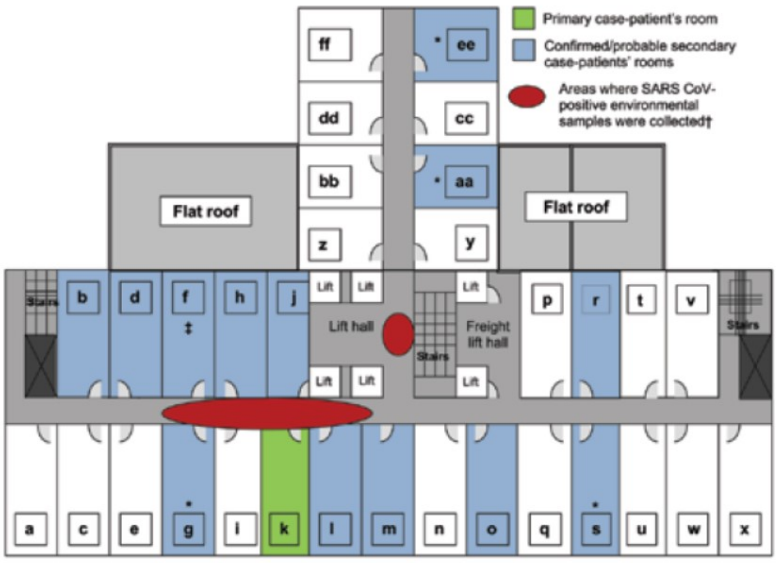


Figure 1. 1 SARS transmission - Metropole hotel 9th Floor, Hong Kong (Braden et al., 2013, p. 864).

The Introduction chapter will explore the concept of crisis, and focus on public health crises. The focus of this thesis is an expert advisory group operating during the SARS outbreak in Canada; an overview of the outbreak, followed by a description of the expert advisory group, will be presented.

Research Context

What is a crisis?

Pearson & Clair (1998) approach the concept of a crisis specifically from an organisational standpoint: "An organizational crisis is a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly" (p. 60); their examples range from a product recall to a natural disaster that eliminates key stakeholders. Hannah et al. (2009) provide a narrower definition, and term it an "extreme event": "a discrete episode or occurrence that may result in an extensive and intolerable magnitude of physical, psychological, or material consequences to – or in close physical or psycho-social proximity to - organization members" (898). An extreme environment is where one or more extreme events are occurring.

This research will adopt the definition by Pearson & Clair (1998) as public health crises hold the same characteristics, except there is specific potential for lives being at risk, in addition to the possibility of catastrophic global spread of disease. Therefore, the definition will be expanded, using Hannah et al.'s (2009) definition to incorporate the concept of magnitude of potential consequences. Furthermore, the word "organization" will be replaced with "population" to reflect the biological nature of infectious disease, thus providing the definition below:

> A crisis is a low-probability, high-impact event that threatens the viability of the population and is characterized by ambiguity of cause,

> effect, and means of resolution, as well as by a belief that decisions must be made swiftly. This crisis may result in an extensive and intolerable magnitude of physical, psychological, or material consequences to – or in close physical or psycho-social proximity to - the population.

The nature of crises are changing; in our increasingly interconnected world, crises are crossing boundaries and becoming more complex (Boin & Lagadec, 2000; Lagadec, 2009). Due to the interconnectedness and speed of air travel, there is also the potential for rapid escalation of crises. For example, guests staying on the same floor at a hotel in Hong Kong carried SARS on multiple aircraft and spread exposure to the virus to countries worldwide (Chan, 2003; Lagadec, 2009). The crises of the future will be characterised by high uncertainty and complexity, a wide breadth of unknowns, vast impact, with unprecedented and unimaginable issues (Boin & Lagadec, 2000; Lagadec, 2009).

There is also a clear difference between an acute crisis, and a long-duration crisis. The response to natural disasters (tsunamis, hurricanes, earthquakes), or human-caused disasters (power plant accidents, terrorist attacks) focuses on action within a 72 hour period (Ruback, Wells, & Maguire, 2013). A public health emergency (specifically that of infectious diseases) requires a completely different type of response, and may take weeks, months, or even years.

Public Health Crises

Compared to natural disasters like earthquakes or tsunamis, the nature of public health emergencies is a "built-in contradiction": for example, when you would normally call for assistance, no one wants to be in close proximity with others, and when healthcare resources are most needed, few will be available (Bissell & Kirsch, 2013).

One type of public health crisis is an infectious disease outbreak; this can be local (epidemic) or global (pandemic). Unlike natural disasters, infectious diseases are insidious. Earthquakes, tsunamis, storms, and fires are immediate, visceral, with potential for acute

catastrophic effect. In contrast, with infectious diseases, there is delayed effect. By the time experts establish the event is significant, the virus has already invaded hosts and reservoirs, and is being amplified (K. E. Weick, 2005). The problem with an invisible and delayed threat is "you are obliged to chase it after the fact, trying to figure out – not where it is now – but rather, where it has been. And you must do this without the benefit of obvious destruction. That makes it much, much harder" (Young, 2006, p. 19-20).

To compound the uncertainty in a crisis situation, we are increasingly at risk from emerging (manifesting in the human population for the first time) or re-emerging (existed previously but are now rapidly increasing in incidence or geographic range) infectious diseases (Morens, Folkers, & Fauci, 2004). More than 300 infectious diseases newly emerged or re-emerged in human populations between 1940-2004 (Jones et al., 2008). In 2018, the World Health Organization added a placeholder for the unknown to their blueprint for prioritising research in public health emergency contexts: Disease X ("Disease X represents the knowledge that a serious international epidemic could be caused by a pathogen currently unknown to cause human disease, and so the R&D Blueprint explicitly seeks to enable cross-cutting R&D preparedness that is also relevant for an unknown "Disease X" as far as possible").[1] The majority of viruses (60%) originated in non-human animal sources and crossed the species barrier to become emerging infectious diseases in humans; furthermore, the number of emerging infectious diseases being caused by wildlife is increasing over time (Jones et al., 2008).

An example of a disease caused by a virus crossing the species barrier is Ebola (Frieden, Damon, Bell, Kenyon, & Nichol, 2014). Ebola is thought to be transmitted from fruit bats to other animals, and then to humans, where it is then transmitted via human-to-human contact. It is a severe and often fatal disease[2]. The Ebola crisis spawned international uproar as it was clear that the magnitude of the epidemic could have been drastically mitigated with swifter response; the 2014-2015 outbreak resulted in over 28,000 infected

[1] https://www.who.int/activities/prioritizing-diseases-for-research-and-development-in-emergency-context Accessed Nov 11, 2019

[2] https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease Accessed Nov 11, 2019

and more than 11,000 deaths[3] and cost more than $3.6 Billion worldwide to control[4]. There are still reoccurring outbreaks, with the current outbreak (as of Nov 5, 2019) there is a cumulative number of 3167 confirmed cases, with 2191 deaths.[5] In an editorial in the New England Journal of Medicine, the authors state that the 2014-2015 epidemic was an avoidable crisis; this is an example where a small limited outbreak, if not managed quickly and effectively, can become "massive" and "nearly uncontrollable" (Farrar & Piot, 2014). They call the international community to look to the future – there will be more outbreaks of Ebola, as well as other new or re-emerging infectious diseases: there is a need for more rapid and effective action in response to these threats (Farrar & Piot, 2014).

One of the key characteristics of a crisis is that it is low probability – and it is tempting for society to be overwhelmed with other concerns. After the SARS outbreak occurred in Canada in 2003, one of the important 'lessons learned' was the need for preparedness. The SARS Commission urges society as a whole to be prepared because the magnitude of the consequences, and the cost, is significant. The SARS Commission stated:

> "No one foresaw the sudden emergence of an invisible unknown disease with no diagnostic test, no diagnostic criteria, uncertain symptoms, an unknown clinical course, an unknown incubation period, an unknown duration of infectivity, an unknown virulence of infectivity, an unknown method of transmission, an unknown attack rate, an unknown death rate, an unknown infectious agent and origin, no known treatment and no known vaccine.
>
> SARS taught us that we must be ready for the unseen … we know now that new microbial threats like SARS have happened and can happen again. However, there is no longer any excuse for

[3] http://apps.who.int/gho/data/view.ebola-sitrep.ebola-summary-latest?lang=en Accessed Oct 18, 2016
[4] http://www.cdc.gov/vhf/ebola/pdf/cost-response.pdf Accessed Oct 18, 2016
[5] https://www.who.int/csr/don/07-november-2019-ebola-drc/en/ Accessed Nov 11, 2019

governments and hospitals to be caught off guard …" (SARS commission executive summary, pg 14).

Public Health Crisis Response

A public health crisis is also an information crisis

Key Decision Makers (KDMs) in an Emergency Operations Centre (EOC) must often act quickly, potentially with incomplete or missing information (Alison et al., 2015; Bharosa, Lee, & Janssen, 2010; Hannah et al., 2009). Yet, paradoxically, they may be saturated with information, potentially causing information overload (Bawden & Robinson, 2009; Eppler & Mengis, 2004). The challenge is to make decisions under these conditions of urgency and overload, while facing chronic exhaustion and burnout, which can lead to impaired judgement and suboptimal choices (van Knippenberg, 2013). Furthermore, the situation itself involves highly demanding, complex, ambiguous, and possibly conflicting issues that compound the sense of overload (Haas, 2006). There are multiple complex decisions to be made, drawing on different types of information and sources (Figure 1.2).

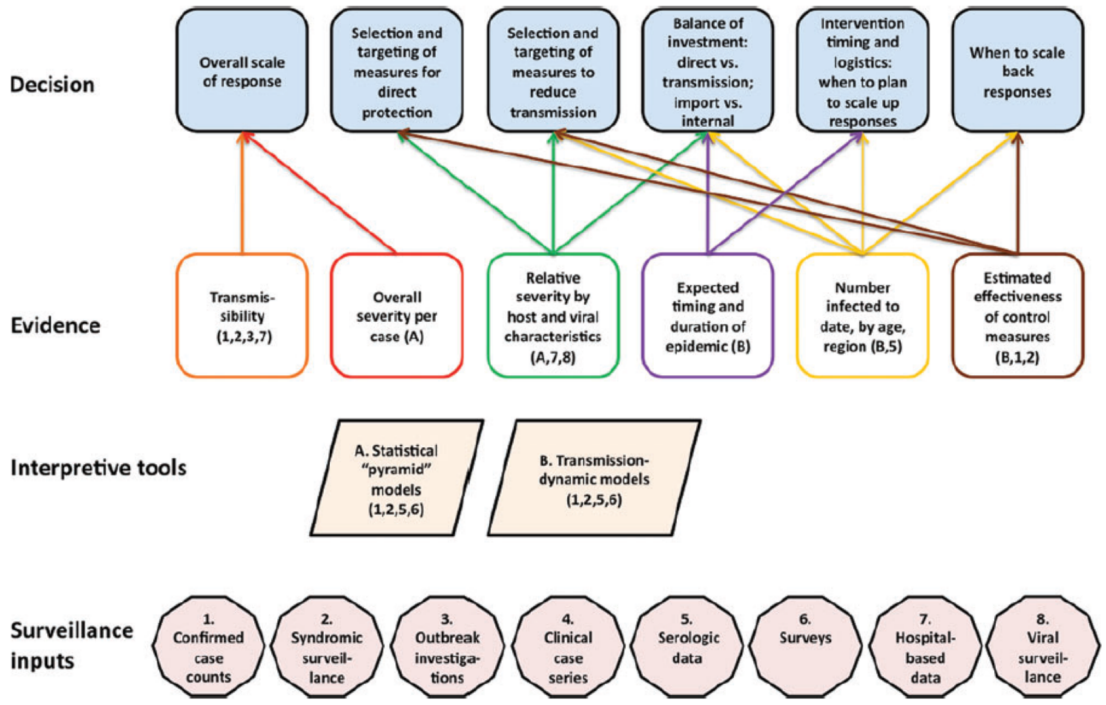


Figure 1. 2 Decision-making and information required in a pandemic response (Lipsitch et al., 2011, p. 94).

The first few decisions that need to be made once KDMs are aware that there is an outbreak is: 1) whether a response beyond routine monitoring is warranted and, 2) the scale of the response (Lipsitch et al., 2011). The important information KDMs require are the transmissibility of the disease (how easily does it spread?), and the severity (will patients get a mild fever and cough or is there high risk of death?). KDMs also require information on the possible determinants of the disease as well as the measurement of the frequency of the disease in the population (Palmer & Evans, 2010). Decisions must be made regarding the scale of response, in relation to the potential cost in lives and resources to local, national, and global economies.

In order to accurately track the disease transmission, a case definition is required. A "case" is a person who may have the disease, and a case definition provides criteria to identify potential cases. These criteria include characteristics such as age, gender, geographic location, time of potential exposure, and clinical features, such as fever, cough, etc[6]. The case definition includes a specific laboratory test if possible; if not, then diagnosis will depend on the clinical features of the disease, in order for specialists to classify cases as 'definite', 'probable', or 'possible' (Palmer & Evans, 2010).

Overall public health crisis response will include the following (Bissell & Kirsch, 2013; Palmer & Evans, 2010):

- Epidemiological surveillance and updating
- Prevention measures: social distancing, quarantine, and isolation
- Distribution of vaccines and medicines
- Surge/overflow
- Family-centred self-care information

[6] https://www.cdc.gov/urdo/downloads/casedefinitions.pdf Accessed Oct 20, 2016

Expert Advisory Groups

KDMs may rely on advice from technical experts such as an Expert Advisory Group (EAG) to assist in sifting through and considering the complex issues that ensue with crisis management. EAGs may be in operation at international, national, or regional levels.

At the international level, the World Health Organisation (WHO) functions as an EAG:

> "WHO offers assistance to affected state(s) in the form of technical advice, supplies and in a number of cases by mounting coordinated international investigations/responses. These responses draw technical resources from within the WHO system and from the Global Outbreak Alert and Response Network (GOARN) which is a collaboration of 110 technical institutions, nongovernmental organizations (NGOs) and networks; it represents a pooled resource for alert and response operations."[7]

At the national level, an example is the New Zealand National Health Emergency Plan, which specifies a role for a Health Technology Advisory group. An example of a regional level EAG is the Ontario SARS Scientific Advisory Committee (OSSAC) in Canada (Campbell, 2006).

[7] https://www.who.int/csr/alertresponse/rapidresponse/en/ Accessed Nov 11, 2019

Overview of SARS

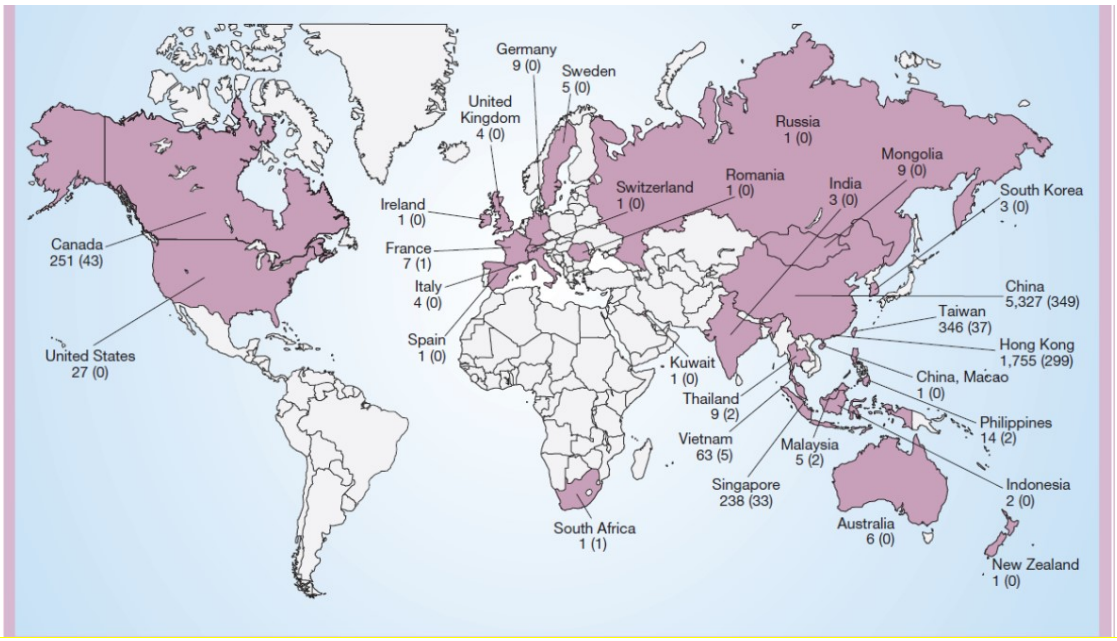


Figure 1. 3 Probable cases of SARS by country (deaths in brackets). (Morens et al., 2004)

The following information is extracted from the WHO (2006) report.

SARS was the first emerging disease of the 21st century, spread internationally with the speed of air travel (Figure 1.3). SARS set off multiple outbreaks around the world, with several "superspreader" events. A superspreader event is when one person passes the virus on to many other people; mechanisms of superspreader events (highly efficient transmission) are still unknown.

Retrospectively identified as the first SARS case, a man becomes ill in China on Nov 16, 2002 and infects a handful of his relatives. The virus spreads, and by early January, authorities in China note the outbreak. On January 23, 2003, an official statement is released about 'atypical pneumonia' by a Chinese regional authority. By early February, the WHO in China and its international surveillance network pick up information about an unusual epidemic of fatal pneumonia-like illness.

Over the next few weeks, there is a flurry of activity between Chinese authorities and the WHO, with the former being uncooperative in opening their borders for a public health investigation.

On February 21, 2003, a superspreader event occurred in Hong Kong.

SARS in Canada, March – June 2003

The following information in this section is extracted from the SARS commission (Campbell, 2006), and SARS archive material[8].

At the Metropole hotel in Hong Kong, a sick doctor from China only stayed one night (February 21); but transmitted the virus to at least 17 people. They travelled to many other countries: Canada, USA, Australia, Hong Kong, Singapore, the Philippines, and Vietnam. The Canadians flew back to Ontario and British Columbia, provinces on opposite sides of the country. The index case (first person infected) in Ontario began an event that affected hundreds of people and caused national hysteria in early and mid-2003.

In Toronto, on March 7, 2003 a man carrying SARS (he caught it from his mother, who had stayed at the Metropole hotel in Hong Kong) was brought in to hospital. He transmitted SARS to several other people, including hospital staff. From March 13-25, several people became ill, and it was noticed to be similar to outbreaks in South East Asia.

OSSAC

When the provincial emergency was declared on March 26, 2003, and the Provincial Operations Centre (POC) was formed, they also established a group of expert advisors – the Ontario SARS Science Advisory Committee (OSSAC). However, there was no existing structure or plan in Ontario for outbreak response, and the "lack of planning meant that

[8]http://www.archives.gov.on.ca/en/e_records/sars/hearings/03Wed.pdf/Wed_12_45_The_Ontario_SARS_Scientific_Advisory_Committee.pdf These are the powerpoint slides from Dr. Brian Schwartz's presentation for the SARS Commission hearings. Accessed Nov 11, 2019.

the core expert groups had to be thrown together in haste without adequate planning or organization" (Campbell, 2006).[9] They were comprised of experts across Canada who volunteered their time to come and assist in Toronto, staying for the days or weeks that they could be away from their jobs; and, in general there were 10-15 people[10] on the committee at any one time. The OSSAC's mandate was to advise the POC on topics regarding the scientific aspect of crisis response, based on best evidence and professional expertise. One of the challenges they faced within the first few days of the Committee's inception was that one of their founding members became ill with SARS; and by March 31, five other members were sent home on quarantine. Figure 1.4 below depicts them at work.

Figure 1. 4 The OSSAC at work.[11]

[9] SARS Commission, Vol4, Problem 11 – No Established Scientific Backup. This chapter provides a description of the OSSAC and their challenges.

[10] http://mail.tscript.com/trans/sars/oct_01_03/index.htm Dr. Brian Schwartz's presentation transcript of the SARS Commission Hearing – Oct 1, 2003. Starting on page 81 of the transcript. Accessed Nov 11, 2019

[11] http://www.archives.gov.on.ca/en/e_records/sars/hearings/03Wed.pdf/Wed_12_45_The_Ontario_SARS_Scientific_Advisory_Committee.pdf From the powerpoint slides from Dr. Brian Schwartz's presentation for the SARS Commission hearings. Accessed Nov 11, 2019.

The SARS Commission (Campbell, 2006) is a comprehensive public inquiry report, covering 5 volumes and spanning approximately two thousand pages; this doctoral research is focusing on one committee, advising the POC. There are many challenges in the crisis management that are also covered in detail by the SARS Commission; as seen in the reporting structure (Figure 1.5), one of the issues was that there were two Commissioners in charge of the crisis response.

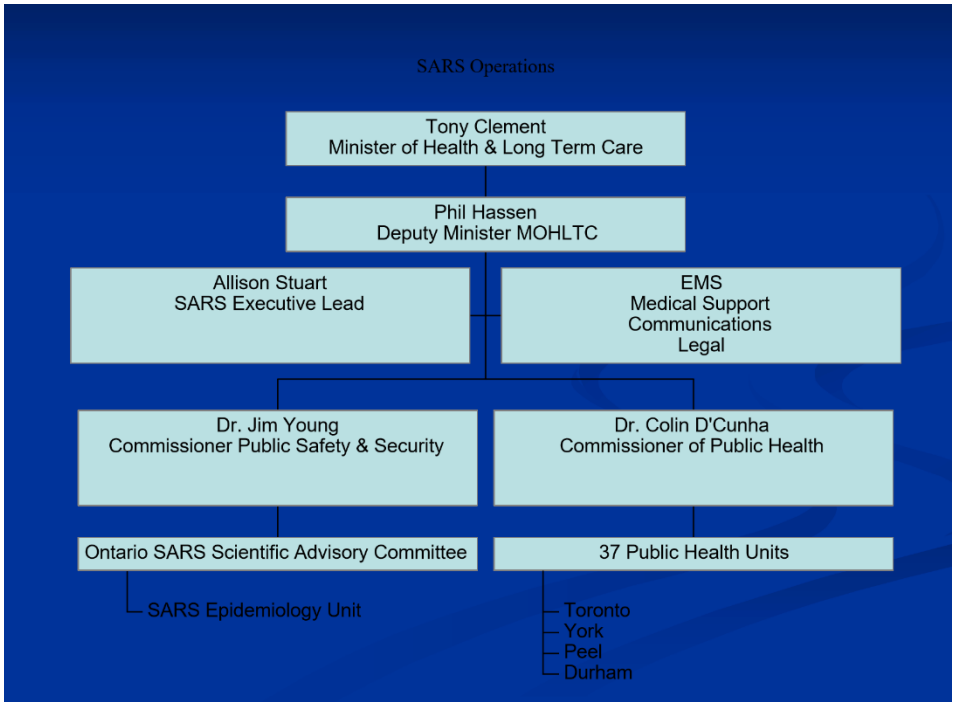


Figure 1. 5 The reporting structure of the provincial SARS crisis response management[12]

The SARS Commission state that the POC, OSSAC and other officials driving the crisis response did remarkable work. They observe: "While Ontario's response was seriously flawed from lack of systems and preparation, it did in the end stop SARS. The wonder is not that it worked badly, but that it worked at all. Starting with nothing, in the face of a deadly new disease, an invisible enemy for which there was no diagnostic test and no

[12]http://www.archives.gov.on.ca/en/e_records/sars/hearings/03Wed.pdf/Wed_12_45_The_Ontario_SARS_Scientific_Advisory_Committee.pdf From the powerpoint slides from Dr. Brian Schwartz's presentation for the SARS Commission hearings. Accessed Nov 11, 2019.

knowledge of how it spread, this jerry-built apparatus somehow did stop SARS." (Campbell, 2006)[13]

The OSSAC was tasked to provide advice in the context of the unknown, with multiple information challenges, including 'turf' issues where data was delayed or withheld from them (this is discussed comprehensively in the SARS Commission[14] and will not be covered in this thesis), data collection, data processing, and data sharing, all under immense urgency. Furthermore, there is a high volume of data dynamically flowing through in a very short amount of time by many different groups of people working in the crisis response. Often there would not be clear channels of communication between groups, which also led to chaos and confusion, especially when multiple people are contacting the same source for the same information. This is also addressed in the SARS Commission.[15]

In terms of the scientific or medical unknowns:

> In the beginning, nothing at all was known about SARS. It was a disease with no diagnostic criteria, symptoms uncertain, clinical course unknown, incubation period unknown, duration of infectivity unknown, virulence of infectivity unknown, method of transmission uncertain, means to prevent spread uncertain, effectiveness of protective measures unknown, attack rate unknown, death rate unknown, infectious agent unknown, origin unknown, no treatment, no vaccine, no prophylaxis, long-term effect unknown. (Campbell, 2006)[16]

As the weeks went by and they rapidly learned about SARS, they found that it was mainly a hospital disease, with health care workers accounting for "over 40% of SARS infections in the Toronto outbreak" (Naylor, 2003, pg 41). Consequently, the OSSAC focused on writing directives for acute care facilities (the evolving focus of the OSSAC to "higher value targets" is discussed in Chapter 5).

The OSSAC were not involved with communicating with the public; their role was clearly as advisors to KDMs. Dr. Jim Young, the Commission of Public Safety & Security, whom

[13] Vol 2, page 355.
[14] see Vol4, Problem 18 – Blockages of Vital information
[15] see vol 4, problem 15 – Overwhelming and Disorganized information demands
[16] Vol 2, page 355

they directly reported to, would be given updates by the Chairs of the OSSAC and then he would give daily briefings along with other leaders. Dr. Young's counterpart was Dr. D'Cunha, the Commissioner of Public Health. His team managed the community within public health units (Figure 1.5). The main socio-political influences on the work of the OSSAC were from health care workers rather than the public. This is explained further in Chapter 5. However, in addition to writing and revising directives, the OSSAC answered questions on a wide variety of issues, including issues affecting the public. An example is providing advice on how to partake in the Easter ritual of Communion, while limiting the risk of transmission. This advice would be sent "up" to the POC, and they would disseminate recommendations to the public; the OSSAC were not in direct communication with the public.

By May, the rate of infection was in decline, and the Code Orange (hospital disaster plans in operation) which was initiated March 29, was revoked on May 14 (Campbell, 2006)[17]. On May 16, the OSSAC was disbanded[18].

The OSSAC was activated again on May 25, due to a new cluster of SARS patients: SARS II began. On July 5, 2003, the WHO announced that the global SARS outbreak was contained.

Research Problem

KDMs face a daunting responsibility: to make decisions in response to a crisis, while being overwhelmed by the volume and complexity of information that is also potentially ambiguous, uncertain or incomplete. The quality of the information also needs to be considered (Lee, Strong, Kahn, & Wang, 2002). As discussed above, during the SARS crisis in Canada, they needed to provide operational decisions and advice without prior experience with this disease. They "had to step forward and make the directives up as they

[17] Vol 2, page 365

[18] http://www.archives.gov.on.ca/en/e_records/sars/hearings/03Wed.pdf/Wed_12_45_The_Ontario_SARS_Scientific_Advisory_Committee.pdf Dr. Schwartz hearing transcript. Accessed Nov 11, 2019.

went along, in a system totally unprepared for a major health emergency" (Campbell, 2006, p. 571).

To answer the call of more rapid and effective response to a public health crisis (Farrar & Piot, 2014), we first need to understand the current steps in the response process. In public inquiry reports, they analyse what happened from a retrospective viewpoint and produce "lessons learned." This is necessary and valuable but does not study the processes within the crisis period; it is not only the decisions that are important, but also the sensemaking that occurs leading up to outcomes. As I have stated before, there is a dearth of research on long duration crisis sensemaking and similarly there is a lack of research on learning *during* the crisis period. By exploring and conceptualising the sensemaking and learning process of experts *during* a long duration crisis response, this may provide insights for future EAGs operating in crisis periods. Furthermore, these insights may provide a platform for the next stage of targeted sensemaking and learning research to serve the call for more rapid and effective response to a public health crisis (Farrar & Piot, 2014).

Research Questions

Research Question 1 (RQ1): What is the general EAG social sensemaking process of creating and revising advice to KDMs during a long duration emerging disease crisis?

This research is exploring the process of providing advice during a long duration crisis; the sensemaking perspective will be utilized to guide the exploration. Sensemaking is a process actors engage in to assess, understand, and decide a way forward when the face the unexpected, ambiguous, or an uncertain situation or issue (K. E. Weick, 1995). A process is defined as: "a sequence of events or activities that describes how things change over time" (Van de Ven, 1992, p. 170).

Weick states that regardless of the urgency of a situation, sensemaking follows a pattern, a sequence (K E Weick, 2010); thus, while Weick's research has been mainly on acute crises,

Weickian sensemaking will be utilised as a framework in exploring a long duration crisis. RQ1 will focus on exploring a pattern in how the EAG, in general, engage in social sensemaking in providing advice. By zooming out to the overall crisis period, we may also see patterns in social sensemaking over time; that leads us to the next research question.

Research Question 2 (RQ2): What are the information dynamics of long duration social sensemaking from the EAG perspective during an emerging disease crisis?

RQ2 is looking at the overall picture of the SARS crisis period, and the information dynamics over time, through multiple sensemaking iterations. Over the course of a crisis event, EAGs may be asked to provide advice on a variety of topics. Also, they may be asked to work on several pieces of advice at the same time, with short deadlines, and with multiple interruptions and trajectory changes. This research question will explore sensemaking over time, including if, and how, the EAG learn *through* the crisis (Lampel, Shamsie, & Shapira, 2009).

Overview of the thesis

The remainder of the thesis addresses these research questions as follows. First, a literature review is presented, drawing on social sensemaking, crisis, and information science research; a conceptual framework is derived from the research literature on social sensemaking during a long duration crisis. The literature review is followed by the methodology. I write the methodology as a narrative journey, depicting where I start, what I faced, and how I adapted to complete the data collection and analysis.

Then, I present two findings chapters, providing the presentation of the data analysis for the research questions outlined above. These findings are discussed at a deeper level, creating meaning and positioning it with the wider research literature in the Discussion chapter. Implications, and recommendations for future research are also in the Discussion chapter, followed by the Conclusions chapter.

Chapter 2: Literature Review

2.1 Overview of Public Health Crisis Research

Crisis research is a relatively new field with research growing significantly since the 1980s; the breadth of topics is extensive, and includes: business continuity, crisis management, risk management, human factors and safety science, political science, psychology, sociology, engineering, and systems theory (Buchanan & Denyer, 2013). However, with such breadth, research has also been conducted in domain silos, and has been fragmentary (Hällgren, Rouleau, & De Rond, 2018), resulting in few integrating frameworks and coherent models that span different perspectives (Buchanan & Denyer, 2013). There is a need for further crisis research (Hällgren et al., 2018).

One of the main challenges in developing coherent research is the methodological limitations in conducting crisis research, particularly there is minimal research using ethnographic designs. As Pipek et al. (2014) explains: "Crises cannot always be anticipated, making systematic research difficult to plan for… there are some crisis situations where it may be a strong disturbance even if researchers remain passive observers" (Pipek, Liu, & Kerne, 2014, p. 344).

Within public health crisis research, most of the research is conducted by medical or public health researchers which aligns with disease outbreaks being a medical and public health phenomena (Bjørkdahl & Carlsen, 2019). However, with regards to social science research there is a strong governance, communications, and information aspect to all public health crises, as they involve the community, (multiple) health systems, and in the case of pandemics – the world. Here I will discuss governance and information issues, which are of relevance to this research study.

Governance

In the Introduction, the research context of this study was discussed, including the challenges of a public health crisis (that the threat is both delayed and invisible) and an

overview of public health crisis response. This type of threat poses a different kind of challenge for response compared to acute crises. This is because an acute crisis such as a wildfire, or industrial explosion have a response phase of up to 72 hours (Ruback et al., 2013), whereas a public health crisis, such as the Ebola outbreaks, can last for over a year (Farrar & Piot, 2014). While public health crises have been managed with an 'All Hazards' approach for many decades, there is research on whether that may be the optimal way to structure the response (Penta, Marlowe, Gill, & Kendra, 2017). Kenis and colleagues propose a typology of infectious disease outbreaks, and corresponding governance structure that may be appropriate (Kenis, Schol, Kraaij-Dirkzwager, & Timen, 2019). There is the added challenge of pandemics being transboundary crises (crossing borders, fields of expertise, levels of governance) (Ansell, Boin, & Keller, 2010). The social science research on the governance of disease outbreaks requires further research, particularly as this type of research is situated in dynamic social contexts, which change over time (Bjørkdahl & Carlsen, 2019).

Information issues

A public health crisis is an information crisis. KDMs must act quickly, often with incomplete or missing information (Alison et al., 2015; Bharosa et al., 2010; Hannah et al., 2009). Yet, paradoxically, they may be saturated with information, potentially causing information overload (Bawden & Robinson, 2009; Eppler & Mengis, 2004). One of the key challenges is that the collection and analysis of scientific data is slower than the needs of the governance in crisis response (Abeysinghe, 2019), thus adding to the difficulty of decision-making in a context of lack of knowledge (Lipsitch et al., 2011). This issue is exacerbated when facing a novel disease, with the high magnitude of unknowns and uncertainty. Decisions must be made while simultaneously gathering and analysing data, building scientific knowledge about the disease, and that may change KDMs stance on crisis response strategy (Abeysinghe, 2019).

There are many information challenges faced during a crisis; often, after a crisis, experts are called to review the events, and the crisis response, and to produce reports on 'lessons

learned.' Hutton completed his 2018 dissertation on knowledge accumulation from a disease outbreak (Hutton, 2018). He studied the 2013 – 2016 Ebola crisis and codified knowledge as represented in 'lessons learned' reports. He notes similarities between the lessons learned reports from the Ebola crisis, and the SARS crisis, more than 10 years prior. Hutton finds that there is a structure (the Global Health Security paradigm) to the processes of producing 'lessons learned' reports, and this constrains the potential of the purpose of these reports. Keller and colleagues (Keller et al., 2012) also conducted research on the constraints of structure. They found that the WHO International Health Regulations (IHR) (this is a formalised system of structured information for international data exchange), and pandemic plans, did not allow for the dynamic needs of on-going sensemaking during a disease outbreak, and thus limited the intended purpose of the IHR and pandemic plans.

This PhD study differs from Hutton's in that I am focusing on learning *through* a crisis, and specifically focusing on the sensemaking of the advisory team during crisis response. Hutton is focused on learning *from* a crisis in the 'lessons learned' reports, and the accumulation of knowledge through the process of creating these reports. We study groups of experts who have different purposes; my participants are advising during the crisis response, and Hutton's participants are evaluating the crisis response and what can be learned. The similarities are that we are both exploring learning, knowledge and sensemaking in the context of a disease outbreak. We also both utilise Weick's (1993) conceptualisation of social sensemaking.

Other research in information issues regarding public health crises, such as in the areas of informatics and intelligence, cover topics such as social media and informatics in the identification of infectious disease outbreaks (Charles-Smith et al., 2015). There is also nascent research in the sociology of public health intelligence (French, 2014; French & Mykhalovskiy, 2013), but this is also related to surveillance (both for chronic and emerging diseases). Public health intelligence research is: "the concepts, methods, practices, and apparatuses assembled to monitor and detect health events" (French & Mykhalovskiy,

2013). Indeed, there has not been much research on any kind of intelligence analysis during a crisis, not only a public health crisis (Hutchins, Pirolli, & Card, 2007; Kang & Stasko, 2014).

While there is research relevant to public health crisis and sensemaking, there has not been a study on the social sensemaking of expert advisors during a public health crisis response. In this research study, I will focus on the information dynamics of social sensemaking during a public health crisis. This section has been an overview of the public health crisis, and crisis response; next, I will discuss sensemaking in general, and review the concepts of social sensemaking in particular.

2.2 Sensemaking overview and definition

There is no central agreed definition on what sensemaking is (Maitlis & Christianson, 2014). Instead, there are general agreements among scholars on sensemaking aspects, or the sensemaking perspective (Sandberg & Tsoukas, 2015), that it begins with the unexpected, and engages cycles of action and interpretation until sense is restored. Weick is the seminal researcher in organisational sensemaking, and began with a socio-cognitive approach, and in later years has viewed sensemaking as socio-constructivist, bordering on phenomological (Maitlis & Christianson, 2014).

There are two key ontological contrasts in the research literature – that of where and when sensemaking takes place (Maitlis & Christianson, 2014). Regarding 'where': one group of scholars see sensemaking as intra-personal, that it is a cognitive or individual process (Dervin, 1998; Klein, Moon, & Hoffman, 2006b; Snowden, 2011). Another group sees sensemaking as social and co-constructed between people, an interpersonal and intersubjective process (Gephart, Topal, & Zhang, 2011; Maitlis & Christianson, 2014; Weick, 1995).

Regarding 'when' sensemaking takes place, scholars debate whether it is retrospective or prospective. The Weickian approach views sensemaking as retrospective: that actors step outside the stream of continuous time to bracket an event in the past to consider and make

meaning of it (Maitlis & Christianson, 2014; Sandberg & Tsoukas, 2015; K. E. Weick, 1995). Another view of when sensemaking takes place is future-oriented sensemaking (Gephart, Topal, & Zhang, 2011; Gioia, Corley, & Fabbri, 2002; Kaplan & Orlikowski, 2013; Stigliani & Ravasi, 2012). Gephart and colleagues (2011) describe future-oriented sensemaking as actors considering multiple possibilities of the future.

Furthermore, there are disciplinary conventions or tendencies; these are not mutually exclusive, as the researchers discussed below are also cited across several disciplines (or fields). However, based on their approach to sensemaking, they are aligned with certain disciplines (Table 2.1).

Table 2. 1 Differing approaches to sensemaking across disciplines

Discipline	Key researchers	Core concepts or theories
Management/ Organisational research	Weick	Meaning creation through enaction and interpretation (Weick, 1995)
Cognitive Psychology	Klein and colleagues	Data-frame theory of sensemaking (Klein, Moon, & Hoffman, 2006b)
Library and Information Science / Communications	Dervin	Sensemaking metaphor and methodology (Dervin, 1998; Savolainen, 2006)
Computer science / HCI	Pirolli and Card	Conceptual model of sensemaking: Foraging loop and sensemaking loop (Pirolli & Card, 2005)

In management and organisational research, Weick is the key researcher in sensemaking. His core concept is meaning creation – that sensemaking is an ongoing process of enaction and interpretation. Sensemaking is triggered when an event occurs that is outside of the expected stream of experience, and meaning creation begins to create a plausible explanation for the unexpected (Weick, 1995).

In cognitive psychology, Richard Klein and colleagues' core theory is the data-frame theory of sensemaking (Klein, Moon, & Hoffman, 2006b). This theory posits a relationship between "mental model formation" (retrospective and explanatory), and "mental simulation" (forward looking and anticipatory). Their work has applications in computer science, in particular Artificial Intelligence (Klein, Moon, & Hoffman, 2006b). They are also thought-leaders in the field of naturalistic decision-making (NDM), which studies how decisions are made in situated dynamic environments (Klein, Moon, & Hoffman, 2006a). There has been extensive research on NDM in military decision-makers (Pirolli & Card, 2005).

In computer science, specifically Human-Computer Interaction (HCI), Pirolli & Card (2005) developed a conceptual model of sensemaking in intelligence analysts. This model has two loops of activities. The first is the foraging loop that focuses on information seeking, filtering, and organising. The second is the sensemaking loop that matches the information to "representational schemas" that fit the data and provide a way to understand it. These are iterative loops, and in general the path is from raw information to processed report (Pirolli & Card, 2005). Klein and colleagues, and Pirolli and Card study sensemaking as process, and also study the outcome as a function of the process (decision-making and intelligence reports).

Dervin's approach to sensemaking is also intra-personal (within an individual), but applied in social communication rather than computer science; she is a key researcher in the fields of communication, and library and information science (Pirolli & Russell, 2011). Dervin's core concept is the sensemaking metaphor (Savolainen, 2006). She posits that each person comes from a unique and situated context. There is a gap in understanding (these gaps unfold as we experience life) that the individual attempts to bridge; this is the act of sensemaking. Dervin's sensemaking metaphor and methodology are often used to study information behaviors (Dervin, 1998; Savolainen, 2006). Dervin and Weick focus on the sensemaking process.

The range of sensemaking across disciplines (Dervin, 1998; Klein, Moon, & Hoffman, 2006b; Pirolli & Card, 2005; Pontis & Blandford, 2016; Snowden, 2011) as well as other approaches of conceiving the research problem were considered for this project, such as naturalistic decision making (Klein, 2015; Klein, Snowden, & Pin, 2011) and situation awareness (Endsley, 1995, 2015). However, research approaches that focus on processes situated in the individual (intrapersonal or cognitive), or focused on outcomes (decisions) rather than processes, were excluded as they are outside the boundary of the research project. Thus, this project aligned with the organisational sensemaking approach that is social and process-oriented.

Within the organisational approach, there is a wide breadth of researchers. Weick is considered a key researcher in organisational sensemaking. His body of research and the researchers that build on his work are termed "Weickian" (Maitlis & Christianson, 2014).

This research will utilize the definition of sensemaking as provided by Maitlis and Christianson (2014) in their review of socially constructed sensemaking research, which follows the Weickian approach, both social and retrospective:

> "a process, prompted by violated expectations, that involves attending to and bracketing cues in the environment, creating intersubjective meaning through cycles of interpretation and action, and thereby enacting a more ordered environment from which further cues can be drawn" (Maitlis and Christianson, 2013, 67).

I follow the view that sensemaking occurs in the social spaces between people, and is carried in conversations; "collective sense is generated in an ongoing, iterative manner, as actors shape each other's meanings in repeated cycles of sensemaking" (Maitlis & Christianson, 2014, p. 95). Researchers who focus on sensemaking in the spaces between actors are not all necessarily in agreement on 'when' sensemaking takes place; some see sensemaking as retrospective (Maitlis, 2005; Maitlis & Lawrence, 2007; K. E. Weick, 1995) and others as future-oriented (Gephart et al., 2011; Gioia & Chittipeddi, 1991; Kaplan & Orlikowski, 2013).

2.2.1 Sensemaking in crisis and non-crisis situations

Concepts from the sensemaking literature are presented, drawing from research in both crisis and 'normal' settings. This is because the pattern of the process has been observed to be the same regardless of the urgency of the situation:

> "As a crisis becomes more severe, sensemaking intensifies, which normally lessens the crisis severity, which then reduces the sensemaking. Phrased in that form, crisis sensemaking … is not all that different from sensemaking that occurs in response to breaches in everyday life. The sequences are similar but the intensities are different. There is an interruption, followed by moments of thought, action to clarify the thinking, and recovery" (K E Weick, 2010).

Another example is a study contrasting how teams respond to the unexpected, looking at SWAT teams and film crews (Bechky & Okhuysen, 2011): "In our data, responses to surprises always exhibited the same pattern … our informants made do with the resources at hand to continue the task… features such as their severity, importance, and novelty were obscured or made irrelevant" (257).

The abductive approach in presenting literature

For the remainder of this chapter, concepts that have emerged from the organisational socio-constructivist sensemaking literature will be discussed. Concepts from the literature will be presented to show what is known, and to indicate what may be discovered through the intended research. This is an abductive approach: Weick explains abduction as the ability to "generate plausible conjectures about the meaning of fragmentary evidence" (K E Weick, 2010). This approach is followed because no other long-duration crisis sensemaking research has been found during the literature search and review process. This review is drawing on research in closely related areas, particularly acute crisis sensemaking.

This is plausible because as in the quote above, Weick has stated that crisis and everyday sensemaking patterns are not that different: "The sequences are similar but the intensities are different" (Weick, 2010). Thus, abductively presenting literature on acute crisis sensemaking and synthesising a conceptual framework to extrapolate what might be plausible in long duration crises is feasible.

In the discussion, I will discuss the findings, and how they met expectations, or diverged, from the conceptual framework in this literature review. The concepts will be presented in the general sequence Weick states in the above quote: an interruption (triggering, bracketing), moments of thought (interpretation), action (enaction), and recovery (assessing plausibility, sensemaking ends).

2.3 Sensemaking Concepts

Concepts are composed of abstract related ideas; they have an "irregular contour defined by its components" (Jabareen, 2009, p. 50). Concepts relate back to other concepts, they have a history, and usually contain components originating from other concepts. A conceptual framework is a network "of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena" (Jabareen, 2009, p. 51).

In the following sections of this chapter, the concepts presented below (Figure 2.1) will be discussed in greater detail.

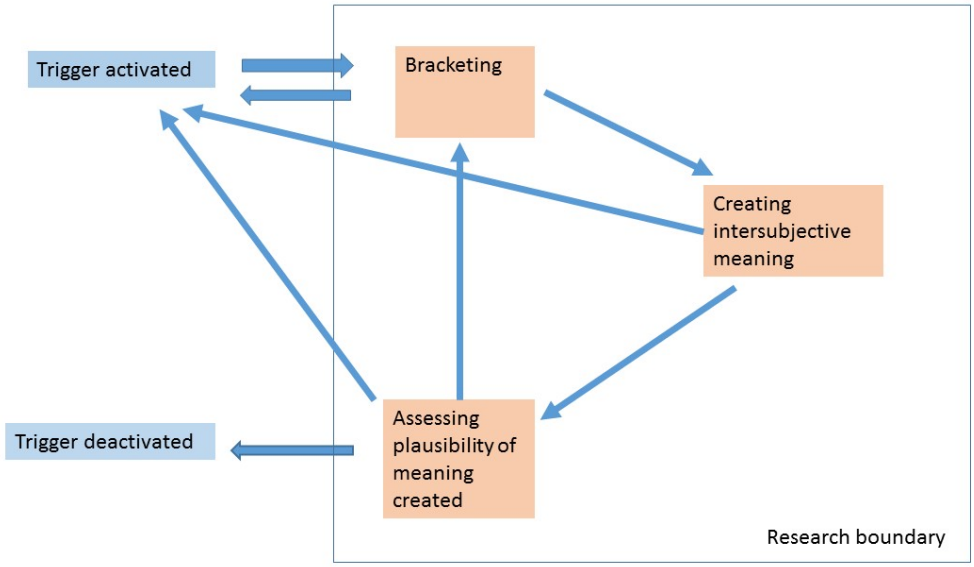


Figure 2. 1 Conceptual Framework of social sensemaking

Sensemaking conceptual framework

Sensemaking is triggered by a violation of expectations that is great enough and important enough to merit collective attention. This leads to the collective attention directed into bracketing, which is creating an initial sense of the situation – what is the shape of the gap between what we expected and what we are experiencing? Following bracketing, an iterative cycle of intersubjective meaning creation is entered, comprised of enaction and interpretation. Action, based on some preconceptions, is taken. Action generates cues, which are then discussed and considered in the interpretation stage. This may result in meaning creation. If not, then another cycle of action to interpretation is taken. If the meaning created is credible, plausible, and "good enough" then the gap that triggered sensemaking is restored with an output produced and sensemaking ends. If the meaning created is not plausible, then the sensemaking process iterates.

2.3.1 Triggers

2.3.1.1 Gap between expectation and experience: Frames and cues

Sensemaking is triggered when current experience (cues) does not match expectations (frames). Cues are units of meaningful information that are drawn from the environment, and can be in any medium, such as words, visuals, sensation, etc (K. E. Weick, 1995). Weick does not specifically define cues, but rather uses a variety of metaphors and examples.

There is a strong body of literature in management research on frames and framing; it stems from the cognitive stream, where a frame is defined as "a knowledge structure that directs and guides information processing" (Cornelissen & Werner, 2014). Orlikowski is one of the first researchers to study frames that are socially constructed, in her well-cited paper on technology frames (Orlikowski & Gash, 1994). Their paper looks at socially-constructed technological frames, and how they can differ within separate groups within an organisation. The socially-constructed technological frame is defined as: "A collectively constructed set of assumptions, knowledge and expectations regarding a technology and its uses and applications in organizations" (Cornelissen & Werner, 2014).

Azad and Faraj (2008) conduct research on technological frame evolution, and illuminate that the process is centred on negotiation. Power and identity between stakeholder groups influences the process of negotiation as actors transition from opposing frames to a truce frame. With further negotiation, this results in frame stabilization, with the shared ultimate goal of getting work done.

While frames are "past moments of socialization", cues are "present moment of experience" (K. E. Weick, 1995, p. 111); triggers for sensemaking start when cues do not match existing frames. However, the gap between frames and cues in itself do not necessarily trigger sensemaking; sensemaking commences when the magnitude of the gap, and the perceived importance, is great enough to cause individuals or groups to be attentive, question and assess the situation, and decide what to do next (Billings, Milburn, & Schaalman, 1980; Maitlis & Christianson, 2014). Weick explains that constructing a relationship between frames and cues is creating meaning (Weick, 1995).

In this research project, I will follow Orlikowski's (Orlikowski & Gash, 1994) definition of a frame as a "collectively constructed set of assumptions, knowledge, and expectations" about the eponymous frame. For example, the SARS frame is the socially constructed set of assumptions, knowledge, and expectations of the disease.

2.3.1.2 Ambiguity and uncertainty

Uncertainty results from a lack of prior frames – people are unaware of ways to interpret cues; ambiguity is a result from many frames that could fit the cues, and people are confused as to which may be the best fit (K. E. Weick, 1995). For example, in Canada, SARS was initially diagnosed as atypical pneumonia because it was an emerging disease, and there was no existing frame for it. It fit the frame for a respiratory illness, but not one within the known canon. In the beginning there was great uncertainty about this disease due to no existing frame (and not even being certain if it was an emerging disease), and then as the weeks passed and more was known, there was ambiguity as to the agent causing the disease.

In the race to determine the cause of SARS, by late March 2003, lab tests found two types of virus – paramyxovirus and coronavirus in samples taken from patients.[19] Scientists around the world were working together; at the WHO, experts were working with three hypotheses, that SARS might be caused by either one of the viruses, or they somehow work together to cause the disease.[20]

A few weeks later, on April 16, 2003, the WHO announce that the coronavirus is the cause of SARS; however, there was not international agreement, as some scientists were not confident that the coronavirus was the cause. An expert in Canada stated that they only found the coronavirus in 40% of SARS patients, and people who show no symptoms of

[19] Waddington, R. Age, chronic ailments, factors in critical SARS cases. *The Globe and Mail.* March 27, 2003.
[20] Beveridge, D. Fears grow bug may be airborne ; Nine tourists come down with SARS after flight to Beijing WHO scientists theorize two viruses may be combining. *Toronto Star.* March 26, 2003

SARS tested positive for the virus.[21] There was ambiguity over the cause of SARS - with confounding cues that did not seem to clearly point to one hypothesis as "true."

For ambiguous situations, people enact, generate cues and draw more information to create meaning and determine the best frame (or then understand they need to build a new frame).

Ambiguity: which frame do I use?

Uncertainty: no frame exists – how do we build one?

2.3.1.3 Normalcy Bias

While triggering sensemaking depends on the gap between cues and frames, even with acknowledging the presence of cues that have the magnitude and potential for significant impact, in some cases actors resist the trigger for sensemaking and rely on existing frames.

Dunbar and Garud (2009) analysed the Columbia shuttle disaster, when on lift-off there was foam shedding from the shuttle. NASA has observed foam shedding over several decades; at first, it was formally noted, and further shuttle launches would not be permitted until the incident was fully investigated. In subsequent years, with the lack of accidents due to foam shedding, and the pressure to ensure shuttles launched according to schedule, foam shedding slowly transitioned to becoming a "normalized deviance" (Dunbar & Garud, 2009). There is a tension between two cultures at NASA – that of meeting the shuttle launch schedules, and the other of ensuring crew safety.

In the specific instance of the Columbia shuttle tragedy, the foam shedding was noted, and many personnel at NASA worked to find an appropriate course of action. Conflicting hypotheses were considered by various groups; however, Mission Management had to choose a course of action, and collectively relied on the existing frame that considered foam shedding to be within normal parameters. Even when faced with the option to activate a

[21] Gorrie, P. Cause of SARS not 100% certain ; New coronavirus only a hypothesis, CDC chief says Puzzling data leave experts still looking for culprit. *Toronto Star*. April 27, 2003.

"Tiger Team" – a fully empowered investigative team with authority across all systems at NASA – Mission Management decided against it, even with the presence of cues (foam shedding) that had potential for serious detrimental outcomes. Days later, they watched as the shuttle disintegrated as it entered earth's atmosphere.

Similarly, in terms of commitment to prior frames, the Centre for Disease Control (CDC) in the United States, initially diagnosed a cluster of deaths in New York as St. Louis Encephalatis (SLE). This was despite inconclusive evidence from different laboratories, and that SLE did not fit the symptoms that were seen in some of the patients. At the same time, there were increasing number of birds dying in the New York area – but as SLE does not cause bird death, the CDC did not see these phenomena as related: "Faced with an emerging disease, CDC initially saw a well-established disease" (K. E. Weick, 2005, p. 53); they were committed to a prior frame, of SLE. It was three weeks later that other laboratories tested the virus and found it to be a new emerging disease, that it was announced the virus was West Nile.

How do experts become committed to prior frames, or do not consider the cues to warrant sensemaking? Colville et al. (2013) suggests that it is due to "a failure in organizational rather than individual imagination" (Colville, Pye, & Carter, 2013, p. 1214).

Colville and colleagues (2012) provide an example of tragic consequences in failure to engage in organizational imagination; prior to the 9/11 bombing of the twin towers, CIA officials received a report informing them that terrorists were learning to fly. However, this information did not trigger sensemaking as learning to fly did not fit any existing frames relating to terrorist activities: "the officials had no means of understanding the significance of the situation: that is, they had no story to go with it and failed to make sense of it" (Colville, Brown, & Pye, 2012, p. 8). The cues they received did not fit any frame, and they did not engage in organizational imagination to consider what terrorists learning to fly *could* mean.

In order to manage and prepare for the unexpected, according to Weick, "you have to weaken or neutralize the tendency to normalize. You have to encourage ambivalence. You

have to question your associates and argue with them, even though the paradigm is underdeveloped (remember, people are working at the edge of codified knowledge)" (K. E. Weick, 2005, p. 56).

2.3.2 Bracketing

Triggering the sensemaking process involves the social acknowledgement of cues that merit collective attention and further investigation. Triggering indicates there is a gap between what we expected and what we are experiencing. Bracketing gives us an initial shape of the gap: "sensemaking is grounded on the ability to bound the continuous flow of human experience – the ability to put some boundaries around a portion of the flow into which one has been thrown when engaging in an activity or project" (Sandberg & Tsoukas, 2015, p. S9).

Bracketing creates an initial sense of the interrupted situation, through extracting cues (units of meaningful information) from the environment. Weick (1995) explains bracketing as a first step in discovery, that people set breaks in the stream of time, and impose labels or categories on the portion set apart; bracketing is the first step to bring collective attention to the gap, the issue at hand.

In February 2003, the roof of the Baltimore & Ohio Railroad Museum collapsed under record snowfall. In this rare event, the executive director realised the extent of the damage and struggled to make sense of the way forward: "There's 30,000 directions I can go. Which one is the right one and which one is the one that makes the most sense?" (Christianson, Farkas, Sutcliffe, & Weick, 2009, p. 852). He was bracketing the situation by making an initial assessment – what is the shape, the size of the gap between what was expected, and what is real? The gap shows a collapsed roof where once it was intact, and 30,000 different potential directions.

Bracketing is social "attention coherence" – where individuals are jointly focusing attention to a particular issue to build the initial assessment, leading to actions such as coordinating

information. Faraj and Xiao (2006) provide a case study of a trauma centre; in situations where a patient suddenly and unexpectedly deteriorates, experts work together, focus on the patient to understand her current status, by gathering pertinent medical and diagnostic information.

2.3.3 Creating Intersubjective Meaning

2.3.3.1 Enactment and Interpretation: Jazz metaphor

One of Weick's key elements of sensemaking is enactment; that is, to make sense of the situation, people take action based on "preconceptions"(K E Weick, 1988), some initial assumptions about the situation. Weick (1988) explains that in a crisis situation, there is a delicate trade-off between safe inaction and 'dangerous' enaction. If we do not act, then we stay in a confusing, ambiguous and/or uncertain state – but do not potentially make the situation worse. Yet, if we wait too long to take action, that may also cause harm. If we take action too soon, we can also make the situation worse from not knowing enough to form a good decision, or not knowing the effect of our action.

Thus, our action in a situation can exacerbate a crisis situation, yet without action, we cannot generate and draw cues to better understand what is going on: "Our actions are always a little further along than is our understanding of those actions, which means we can intensify crises literally before we know what we are doing" (K E Weick, 1988, p. 308).

In order to interpret and understand the cues generated from enaction, actors discursively co-constitute meaning: they talk about it. Jazz orchestras are an apt metaphor: "members must listen closely to each other, take turns leading and following, and respond together in real-time to novel or unexpected performance" (Maitlis & Christianson, 2014, p. 78).

Schön (2001) elaborates on the jazz metaphor, which illustrates the following subsections:

> When good jazz musicians improvise together, they display a feel for the performance. Listening to one another and to themselves, they feel where the music is going and adjust their playing accordingly. They are inventing on-line, and they

> are also responding to surprises provided by the inventions of the others. A figure announced by one performer will be taken up by another, elaborated, and perhaps integrated with a new melody. (2001, p. 12)

2.3.3.2 Relating Cues to frames

Weick (1995) states that creating meaning is the connection of a cue to a frame. Mutual construction of meaning is seen in Bechky & Okhuysen's (2011) study on SWAT teams and film crews; these groups would regularly meet to draft agreement on their work. In real-time (returning to the jazz metaphor) they would discuss, plan and revise their group goals, how their tasks have been progressing thus far, and how to move forward in the face of unexpected events. When facing the unexpected, these teams were able to question their commitment to prior frames, and be creative in considering possibilities for new frames, or adapting existing frames: Weick explains abduction as the ability to "generate plausible conjectures about the meaning of fragmentary evidence" (K E Weick, 2010). For example, for the film crews on a day of shooting, a specialist operator for an aerial camera did not show up to set, and the team discussed the problem, and found two other cameramen who were able to negotiate roles; one could operate the aerial camera, and the other could take the first cameraman's role. Their ability to create new frames, or modify existing frames, is referred to as adaptive sensemaking (Maitlis & Sonenshein, 2010).

Similarly, at a trauma centre, patient care teams co-create an understanding of the patient's situation: "The way we cope with [mysteriously deteriorating patients] is to consult with our colleagues; to vocalize more freely about what we think about the possibilities; to consult at the highest level of the organization with those who might have more experience, or might have seen cases or something like it before" (Faraj & Xiao, 2006, p. 1165). The specialists at the trauma centre converse about the situation (patient) bracketed, and consider possibilities for the diagnosis (matching cues and frames in interpretation stage). They must determine a course of treatment in real-time (like jazz musicians), as well as

balance the tension of choosing the optimal course of action and the need to act as quickly as possible. Similarly, Christianson (2019) also studied medical teams engaging in real-time sensemaking – noting that more successful teams are monitoring and updating cues, generating possible meanings, and testing and monitoring those possibilities for feedback.

Lagadec (2009) suggests that in our hypercomplex world of crises that are unimaginable, we need people who are both creative and intelligent; people who can generate wild possibilities to connect cues to frames.

2.3.3.3 Response repertoires (library of frames)

Bechky & Okhuysen (2011) highlight the efficacy of a wide response repertoire in managing the unexpected, and being able to engage in adaptive sensemaking to make/remake frames. Christianson et al. define "response repertoires": "the stock of routines, habits, and roles that have been experienced, as well as the capability to recombine portions of the stock in novel ways. We emphasize that response repertoires include both realized and latent potential… for much of the stock remains outside awareness and is taken for granted until moments of interruption and attempts at recovery call attention to it or require actions that draw upon it" (846-7).

Thus, response repertoires can be visualized as a library of frames, stored in the social space and retrieved in response to the situation at hand. For situations where cues to not match existing frames, the most relevant frame(s) may be retrieved, and adapted to the situation (Maitlis & Sonenshein, 2010).

With more experience as practitioners, or "experts" – actors develop a greater collection in their library of frames, and may develop the tacit ability or "capacity" to sense weak cues that could eventually develop into crises. That is, with more experience, there is a greater likelihood of sensing weak cues and stopping a crisis before it starts, or at least mitigating the effect. Weick explains that "people see those events they feel they have the capacity to do something about. As capacities change, so too do perceptions and actions" (K E Weick,

1988, p. 311). The greater the number and variation of frames to draw on, the more likely the ability of the actors to sense an impending crisis earlier.

In an ecological sensemaking example, Whiteman (Whiteman & Cooper, 2011) was conducting fieldwork in subarctic Canada. She was unfamiliar with the terrain, and was walking with an experienced local person who knew the area well. As they were walking on the edge of a river, she slipped, fell, and was almost pulled in by the water rapids. Fortunately, her guide heard her yell and was able to pull her out of the water. Because of lack of experience in that environment, she did not know to look for black ice, the cue for potential danger.

Similarly, in the SARS example earlier in this chapter, without prior experience of the emerging disease, the cues received were not matched with a "danger!" signal. The lack of prior frames slowed the trigger for sensemaking as actors initially attributed the cues to the wrong disease frame (atypical pneumonia).

Learning through rare events

While greater sensitivity to weak cues can be developed through a wider library of frames, the process of meaning creation can also become more coherent with time as the group expands their library together. There has been substantial research on learning from rare events, but there is limited research in learning through (during) rare events (Müller-Seitz & Macpherson, 2013). Research on an organisation experiencing three successive rare events revealed that actors learned *through* these events: "these acts of organizing – acts such as interpreting, relating, re-structuring, and reworking identity – become stronger and more flexible not only within a single rare event as it unfolds but also across a series of rare events" (Christianson et al., 2009, p. 850). Learning is also related to adaptive sensemaking: that as organisations learn from unusual experiences, they draw on past frames and modify them to respond to new experiences (Garud, Dunbar, & Bartel, 2011).

2.3.3.4 Enaction-interpretation iterations

Weick provides a fascinating example that we may not always need the "right" frame; sometimes it is a matter of organising actors in a direction, so that they will take action and make sense along the way. Weick (1995) discusses the example of the Hungarian soldiers lost in the Alps during a snowstorm but who found a map and used it to navigate out of the mountains. They later realised it was a map of the Pyrenees! Even using the wrong map they were able to initiate sensemaking, and find their way out. It is cohering as a social group with a common goal (get back to camp), and working together to collect cues, interpret them, and revise trajectory as needed until they reached their destination.

2.3.3.5 Incoherence/ Discordance

From a meaning creation perspective, we can see that meaning is lost when there is a lack of group coherence; using the jazz metaphor, when the musicians cannot either 1) listen to the other musicians, and/or 2) draw on their own repertoire to respond. This is seen in many of the case studies of disasters; for example in the Mann Gulch disaster (K. E. Weick, 1993), the fire jumpers were overwhelmed by the magnitude and catastrophic potential of the fire, and could not think clearly enough to cohere and decide on a way forward together.

Another example is a consultancy task force with representatives from five different oil companies attempting to work together on a project. In the group meetings, individuals were overly concerned with power and face games, such that collective and coherent sensemaking could not be established. This resulted in the endeavour failing, due to struggles to harmonise, and a persistent animosity (Patriotta & Spedale, 2009).

2.3.4 Assessing plausibility of meaning created

Weick suggests that plausibility is "a good story" (K. E. Weick, 1995, p. 61). It includes elements of coherence, reasonableness, and is socially acceptable and credible. In short, plausibility is socially negotiated and agreed upon, and is itself a process.

Within meaning creation, plausibility of the frame in development is evaluated in real-time; if the frame is too partial, and not ready for a full consideration of plausibility and being released from the sensemaking process, then another cycle of enaction and interpretation is entered.

In the design world, Stigliani & Ravasi (2012) conducted an ethnography of a design firm; after the design team collectively worked on a product, and came to a point where they were 'confident enough' to present their prototype(s) to their clients, in a process of assessing plausibility. The design team presents their work and engages with the client about what has been produced in response to the 'trigger' (design request) and discuss the plausibility in terms of the product meeting the requirements, what needs to be refined, what is kept, and any major changes.

Faraj and Xiao (2006) discuss a situation where plausibility is assessed within the sensemaking group. At a trauma centre, for a patient deteriorating mysteriously, the care team engage in cycles of meaning creation– multiple tests to consider possible meanings, and consulting with other experts. There is a point where the team needs to agree on a (plausible) diagnosis and then take action on the course of treatment.

2.3.4.1 Satisficing

Schön (1995, 2001) states that the kind of problem that practitioners face are often complex, messy, and without a clear path to resolution. There is often not enough time to consider all the information, or indeed to fully bracket and consider the entire situation; rather only part of the situation is bracketed, thus only part of the cues available are considered, and the meaning created is considered ready for 'release' when it is plausible, pragmatic,

credible, and socially accepted – or "good enough." Satisficing is a term coined by Herbert Simon and is a combination of "satisfactory" and "sufficient" – basically, a solution that is "good enough" (Simon, 1956).

Weick suggests that in sensemaking, plausibility is a higher priority than accuracy (K. E. Weick, 1995). This is due to many reasons – including a speed/accuracy trade-off, where particularly in a crisis situation it is more important to have plausible 'sense' rather than accurate 'fact' that may take longer to verify. Satisficing can be seen as prioritising plausibility – and in the 'real-world' of practice, once there is just enough information (Manheim, 2014; Prabha, Silipigni Connaway, Olszewski, & Jenkins, 2007), moving forward to get on with the task at hand (K. E. Weick, 1995).

2.3.5 Trigger de-activated (output)

When the group has collectively agreed that the meaning created is plausible and "good enough", then they move to produce the output. The output of the sensemaking process restores the 'gap' between current experience (cues) and expectations (frames) initially noticed in the triggering stage; as Azad and Faraj (2008) explain, the process of (coherent) sensemaking leads to a stabilized frame, which then ends the process. For example, Maitlis (2005) followed three British orchestras over several years, and observed many sensemaking processes, one of which was the negotiation of the new season's programme (stabilized frame).

2.4 The medium of sensemaking: narrative

The definition of narratives is: "temporal, discursive constructions that provide a means for individual, social, and organizational sensemaking" (Vaara, Sonenshein, & Boje, 2016, p. 496). As Vaara et al. illuminate – narratives provide a means, a medium, for sensemaking. The majority of sensemaking studies focusing on narrative take a socio-constructivist approach, as will this research study (Abolafia, 2010; Cunliffe & Coupland, 2012; Patriotta, 2003).

2.4.1 Other influences of sensemaking: emotions, physical context, artefacts

This research project will not include the influence of emotion, context, or artefacts, although they are influential in crises and urgent situations. While this research is focused on crises, public health crisis responses are of long duration, as compared to an acute crisis response phase that is up to three days in length; as such, narrative is considered to be best suited to this research as one of the key characteristics of narrative is its temporal nature, and it can be bracketed for short and long periods of time. Current research in emotions on sensemaking includes Cornelissen's case study of the Stockwell shooting (Cornelissen, Mantere, & Vaara, 2014); they look at communication, emotions, as well as materiality during the pursuit of the suspected terrorist. There is also a recent review of emotion in sensemaking (Steigenberger, 2015). Other research highlights the embodiment of sensemaking (Cunliffe & Coupland, 2012), also incorporating emotion, specifically looking at the Mann Gulch disaster and the effect of fear on sensemaking (Maitlis & Sonenshein, 2010). Balogun and colleagues (2014) discuss the effect of the spatial arrangement of boardrooms, and artefacts such as PowerPoint, flipcharts and screens.

2.5 Adapting the Weickian retrospective approach

> "The crucial lesson was that the scope of things I didn't know wasn't merely vast; it was, for all practical purposes, infinite. That realization, instead of being discouraging, was liberating. If our ignorance is infinite, the only possible course of action is to muddle through as best we can" (Schwartz, 2008).

So far in the literature review, I have drawn on concepts in the organisational sensemaking literature. Now I will explain a gap identified in the literature review, and how I have provisionally adapted concepts (as stated earlier in this chapter, with an abductive

approach) from the field of Education to re-conceptualise the enaction-interpretation process.

2.5.1 Prospective Sensemaking

Weick has been criticized for not conceptualising anticipation in the sensemaking perspective (Sandberg & Tsoukas, 2015). They discuss this issue as troublesome because an inherent aspect of a practitioner is the ability to anticipate the consequences of actions from experience. Future-oriented sensemaking is defined as: "sensemaking that seeks to construct intersubjective meanings, images, and schemes in conversation where these meanings and interpretations create or project images of future objects and phenomena" (Gephart et al., 2011). Gioia and Chittipeddi (1991) also discuss future-oriented sensemaking in the context of strategy making. Stigliani and Ravasi (2012) study future-oriented sensemaking in a design firm. There has not been a body of research integrating retrospective and prospective sensemaking.

One possible way to integrate retrospective and prospective sensemaking is with Schön's work on the Reflective Practitioner (Schön, 1995). Parallel to Weickian retrospective sensemaking, when Schön's practitioner is faced with the unexpected, he stops to bracket the situation and considers what his next move will be. He begins to reflect-in-action and generate multiple conjectures, possibilities, of actions to take from that moment and follow the action through to the desired outcome (prospective sensemaking). Then, the optimal possibility for that context is chosen and enacted (action, as Weick says, with "preconceptions" – the expectations they had from imagining that possibility and following it to the desired outcome). The action generates cues that are then analysed; this is parallel to Schön's reflection-on-action (Figure 2.2), where practitioners consider action and the cues generated, and relate it to the original preconceptions (which lead back to the gap in bracketing). Then the group moves to reflection-in-action to choose next steps. If the meaning created seems coherent then they may begin an assessment of plausibility; if the meaning created is incomplete, or incoherent, the group may decide to enter another cycle of enaction-interpretation.

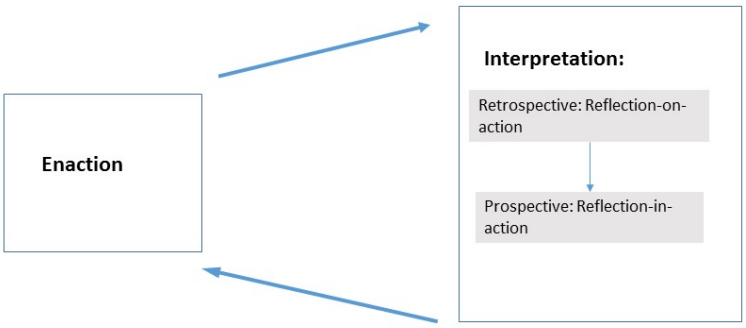


Figure 2. 2 Weickian Enaction-Interpretation cycle integrated Schön's concepts.

2.5.2 Components of conceptual framework

From the literature review, there were four main influences in extracting the key concepts (Table 2.2): Weick (1995), Maitlis & Christianson (2014), Sandberg & Tsoukas (2015) and Schön (2001).

Table 2. 2 Concepts in framework

Concepts	**Key References**
Triggers	(Maitlis & Christianson, 2014); (Sandberg & Tsoukas, 2015); Weick (1995)
Bracketing	(Maitlis & Christianson, 2014); (Sandberg & Tsoukas, 2015); Weick (1995)
Intersubjective meaning creation (enaction-interpretation)	(Maitlis & Christianson, 2014); (Sandberg & Tsoukas, 2015);

	Weick (1995)
Assessing plausibility of meaning created	(Maitlis & Christianson, 2014); Weick (1995); (Sandberg & Tsoukas, 2015)
Trigger de-activated	(Maitlis & Christianson, 2014); (Sandberg & Tsoukas, 2015); Weick (1995)
Reflection-in-Action Reflection-on-Action	(Schön, 2001)

This literature review provided key concepts and a high-level conceptual framework of sensemaking that may be applied in a public health crisis response context. The goal of the research would be to explore these concepts in detail, identify potential new concepts, and illuminate the relationships between concepts.

Chapter 3: Methodology

Summary of Methodology

Element	Summary
Paradigm	Socio-constructivism
Approach	Qualitative
Design	Constructivist Grounded Theory approach with Process research design: iterative data collection and analysis, followed by evaluation
Data Collection	1. Documents (including newspapers, archival materials, meeting minutes, reflections/memoirs) 2. Interviews
Data Analysis	Constructivist Grounded Theory approach, utilising deductive, inductive, and abductive reasoning
Theories	Constructivist Grounded Theory with social sensemaking perspective

Qualitative approach

The research questions are exploring the experience of a group of people, and understanding the process (the "how") in which they engage in sensemaking; therefore, the qualitative approach is taken, to elucidate human experience (Leedy & Ormrod, 2013).

Paradigm, and epistemological and ontological assumptions

A paradigm is a worldview; it defines the nature of the world, and all that is possible in terms of relationships within the world and its parts (Guba & Lincoln, 2011). This research is anchored in the Socio-Constructivist paradigm, which carries the ontological assumption (the nature of reality) that reality is socially constructed, there are multiple realities, and that aspects are shared among individuals and also across cultures (Guba & Lincoln, 2011).

The epistemological assumption (the nature of knowledge, or knowing) of the socio-constructivist paradigm conceptualises knowledge as being co-created between actors. In this research study, the researcher and participant co-create the data, during the intersubjective discourse of the interview act. Furthermore, the researcher conducts analysis through a situated, subjective, individual lens; thus, in the socio-constructivist paradigm, research findings are "constructed" rather than reflecting an objective truth (Charmaz, 2006; Guba & Lincoln, 2011).

Constructivist Grounded Theory

Grounded theory's origins were in the 1960s with the publication of *Discovery of Grounded Theory: Strategies for Qualitative Research* (Glaser & Strauss, 1967). Glaser & Strauss advocated an inductive approach of developing theory from qualitative data, rather than testing hypotheses that were deduced from existing theories (Charmaz, 2006). Their book "provided a powerful argument that legitimized qualitative research as a credible – and rigorous – methodological in its own right rather than simply as a precursor for developing quantitative instruments" (Charmaz, 2006, p. 8). However, they were operating from the positivist paradigm, which assumes there is an objective, empirically testable and verifiable, "Truth," (Guba & Lincoln, 2011).

Kathy Charmaz is the key methodologist in Constructivist Grounded Theory. She states that for her, "subjectivity is inseparable from social existence" (Charmaz, 2006, p. 14). She reconfigured grounded theory to situate it within a socio-constructivist paradigm, to recognise that both the data, and the researchers' interpretation of it, is subjective.

There are nine elements to a grounded study (Charmaz, 2006, p. 15):

1 Conduct data collection and analysis simultaneously in an iterative process

2 Analyze actions and processes rather than themes and structure

3 Use comparative methods

4 Draw on data (e.g. narratives and descriptions) in service of developing new conceptual categories

5 Develop inductive abstract analytic categories through systematic data analysis

6 Emphasize theory construction rather than description or application of current theories

7 Engage in theoretical sampling

8 Search for variation in the studied categories or process

9 Pursue developing a category rather than covering a specific empirical topic

Charmaz clarifies that she provides flexible guidelines with the Constructivist Grounded Theory method, and that she has found many studies that take elements of this method and other approaches in qualitative data analysis in their studies (Charmaz, 2006).

I will also be taking a Constructivist Grounded Theory approach, yet not purely Grounded, as I am incorporating the sensemaking perspective and will have some apriori codes. This is discussed later in this chapter, in the data analysis section. However, the overall process as depicted in Figure 3.1 is what I have adhered to, although as Charmaz (2006) states, there are iterative and concurrent cycles of data collection and analysis, and that cyclical iteration is not shown in the linear process below.

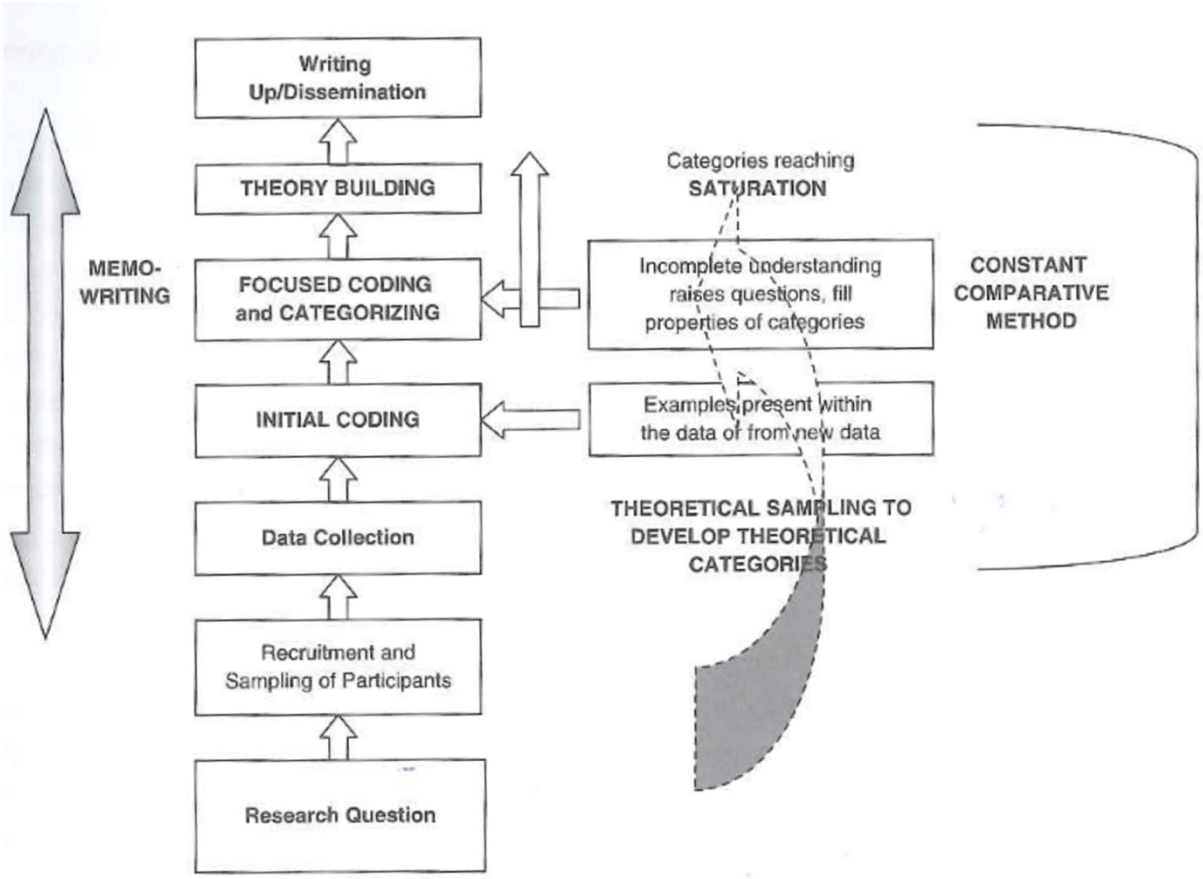


Figure 3. 1 Constructivist Grounded Theory process (Charmaz, 2006, p. 18)

Process research

In addition to Guba & Lincoln's description of the socio-constructive ontological assumptions, Charmaz (2006) also describes the socio-constructivist paradigm as "processual." This is logical, as socio-constructivist's see reality as being co-constructed between people, based on a process of discourse. As this research is studying the social sensemaking process of a team of experts, elements of process research design are also incorporated. In parallel to Constructivist Grounded Theory, process research may also be iterative; it starts with a discovery phase to potentially identify patterns, and this is

progressively refined until the study has reached a point where the findings may be evaluated, in a 'confirmation' phase (Poole et al, 2017). Thus, after iterative data collection and analysis, there will also be an evaluation stage where the findings are taken back to a select group of participants for feedback.

Other researchers have also utilised a grounded theory strategy, with an iterative abductive method of data analysis, to develop theory regarding sensemaking (Christianson et al., 2009; Cornelissen et al., 2014).

Data Collection

The data collection and analysis were conducted simultaneously, in an iterative process (Charmaz, 2006). However, in describing the processes in this chapter, I will discuss them separately. I have provided an overview of the iterative process as a guide to the data collection and analysis process (Table 3.1).

Table 3. 1 Data collection and analysis simultaneous iterative process

1	2	3	4	5	6	7	8
Data Collection: Newspapers and Archives	Data Analysis	Data Collection: Interviews (first cluster)	Data Analysis	Data Collection: Interviews (second cluster)	Data Analysis	Data Collection: Feedback and Evaluation Interviews	Data Analysis and write up
January to July 2017	January to October 2017	October 2017 to Jan 2018	October 2017 to June 2018	June and July 2018	June 2018 to Dec 2018	Dec 2018 to Feb 2019	Dec 2018 to October 2019
Newspaper: Table 3.2 Archives (multiple agencies): Table 3.3	Constructivist Grounded Theory analysis	In person, over Skype and over phone (Table 3.4) First cluster of interviews (Figure 3.2)	Constructivist Grounded Theory analysis of interviews (Figure 3.3)	In person, over skype, and phone (Table 3.4) Second cluster of interviews (Figure 3.2)	Constructivist Grounded Theory analysis of interviews (Figure 3.3)	In person, over skype, and phone (Table 3.4) Evaluation interviews (Figure 3.2)	Constructivist Grounded Theory analysis of interviews (Figure 3.3)

The research design includes seeking archival data, and other documents, in addition to conducting interviews with participants. Bowen (2009) explains that documentary analysis is often supplemented with interviews: "Often, documentary evidence is combined with data from interviews and observation to minimise bias and establish credibility" (Bowen, 2009, 38).

Documents and archival material

Documents include all printed and digital materials, such as agendas, minutes, books and brochures, diaries, letters, maps and charts, etc (Bowen, 2009). Document analysis is often used in conjunction with other data collection methods as a means of triangulation, "to seek convergence and corroboration through the use of different data sources and methods" (Bowen, 2009, 28). There are several public inquiry reports freely available to the public, such as the SARS Commission (an independent report).

During the research design phase, it was envisioned that the multiple types of data would all work together to answer the research questions. As the data collection and analysis unfolded, it became clear that the key data were the interview data; data that is co-constructed between the researcher and participant. The archival materials and other data are important in that they serve to corroborate the interview data, and provide a rich descriptive case.

Collecting Archival material

Newspapers

The aim was to complete the newspaper analysis before scheduling the interviews to gain further insight to the societal context of the crisis event (Müller-Seitz & Macpherson, 2013).

In January 2017, the newspaper data collection process began. I recorded the search strategy and also the method for searching and downloading the two newspapers, a national (The

Globe and Mail) and local (Toronto Star). 1552 articles for TGAM, and 1647 for TS were downloaded respectively.

Criteria for inclusion/exclusion (I/E) were developed and applied to screening the 3199 articles (Table 3.2). The focus was on retaining articles that covered the science or public health aspect of SARS that are Canadian, or relevant to Canada, not the economic, societal or reputational cost. Articles on pharmaceuticals or molecular science for therapy of SARS patients are also excluded as this research is focusing on the sensemaking of an outbreak, and controlling transmission. The final number of articles for analysis were 399, with a total of 722 pages, single-spaced.

Table 3. 2 Inclusion and exclusion criteria for screening newspaper articles

Include	**Exclude**
Full articles Primary topic of SARS Canadian response (or relevant to) Letters to editor that are written by experts (doctors, epidemiologists, etc)	Articles that are not relevant to SARS, or only mention SARS, but it is not the main topic Political, societal, or economic impact of SARS Drug therapy for SARS

Archives of Ontario and data collection in Canada

When the data collection process began in Canada, several months were budgeted to collect data from the archives. Once I arrived on site, in June 2017, I found that the records identified in the Archives database did not hold direct materials regarding the OSSAC. I further consulted with Archivists within the institution and the consensus was that the materials were likely still at the government ministries, and that I should pursue the data there. Subsequently, only a day was spent at the Archives, and then several weeks were

spent hunting down where the data might be housed, through calling government offices or searching online.

I contacted all three levels of government involved in managing the SARS crisis in Toronto, and sought data through the primary officer located in their respective FOIPP or recordkeeping offices. The names of the offices, and the data collected, are listed in Table 3.3. The data that was most relevant for this study was the OSSAC meeting minutes, which were retrieved from the MoHLTC Emergency management branch. There were no digital records of the minutes. I sorted through several boxes of records to find the meeting minutes and took pictures of these documents, with permission. The MCSCS provided over 800 pages of data, of which, most were epidemiology reports.

Table 3. 3 Archival material data collection in Canada from multiple agencies and entities

Source	Dates	Office contacted	Data collected
Newspaper Databases	Jan 2017	n/a	Retrieved newspaper articles from TGAM and TS
Archives of Ontario	June 2017	Archives	SARS Commission (also available for free online) Other data – pictures taken
City of Toronto	July/ Aug 2017	City of Toronto FOIPP	22 pages, not relevant
Ministry of Health and Long Term Care (MoHLTC)	July 2017	Emergency management branch	OSSAC minutes and documents (directives, guidelines, various documents (pictures taken) 105 pages
Health Canada	July 2017	Health Canada FOIPP	No results/ data
Ministry Of Community Safety & Correctional Services (MCSCS)	Initiated contact on Nov 2017; received data on May 2018	MCSCS FOIPP	830 pages – sent in PDF format on a USB key. Approx. 80 pages reviewed in greater detail for relevance to research study, after sifting.

Ethics approval

I successfully defended the research proposal in November 2016, and subsequently submitted an application for ethics approval. This was confirmed in June 2017 by the School of Information Management Human Ethics Committee, reference 24019.

To safeguard the identity of participants, pseudonyms are used, or a generic identifier, such as "an infectious disease expert." The voice recordings and transcripts that may identify participants are kept in secure password-protected University drives, or password-protected personal computer.

Since the OSSAC (the group being studied) is identified, and members of this committee are named in documents in public record, it may be possible for a participant to be identified if a reader is familiar with their membership in the OSSAC and recognise their patterns of speech in the quotes. This is clearly stated in the consent form, which all participants have read, indicated that they understood, and signed. The information sheet and consent form are in Appendix 3.1 and 3.2 respectively.

Ministry of Health and Long Term Care (MoHLTC) confirmation

During the ethics application process, it was clear that ethics approval was required for human subjects. There were several issues of consideration that were unclear – that is, do we also require ethics approval from my University to review sensitive materials from the Archives of Ontario – or is their FOIPP process and approval sufficient? Also, the OSSAC operated under the MCSCS (under a different name in 2003), but in SARS II was under the MoHLTC. Should this research project require official acknowledgement or permission from either ministry? Upon further consideration, because this research is not considering the decisions, outcomes, or evaluating the products of the OSSAC, it was not necessary to seek permission from the Government body to move forward. This project is exploring the perspective of these individual experts on the nature and process of social information dynamics.

However, as the data collection progressed, one core member of the OSSAC required acknowledgement from the MoHLTC before participating in this research. I contacted the MoHLTC, submitted the synopsis and goals of my research, including the projected outcomes. Subsequently, I was sent an informal e-mail from the Director of the Health System Emergency Management Branch, within the MoHLTC, that they have no general concerns with any participant sharing their experience as part of this research project.

Interviews

RQ1 is investigating the *process* of sensemaking, specifically of creating and revising directives, from the experiences of participants of an event fifteen years or more ago. Process research is similar to grounded theory method in that it is iterative:

> "The complexity and limitations of process data means that sequence analysis generally starts with a 'discovery' phase in which we conduct exploratory analysis to identify potentially meaningful patterns and progressively refine our understanding until we are able to validate our findings … about the sequence in a 'confirmation' phase of inquiry." (Poole et al, 2017, pg 261)

The research interviews were separated into clusters, because the participant pool is limited. They are a select group of people who served on a specific committee in 2003, so it was logical to separate the data collection in order to first explore, then to further flesh out findings with a second group, and then follow-up with feedback and evaluation (the 'confirmation' phase of inquiry as Poole et al state above). RQ2 is exploring concepts, which nestles well with the design prescribed by RQ1, because having a discovery, probing (theoretical sampling), and then confirmation phase also allows for deeper exploration and richer description of concepts.

The first cluster of interviews served as exploration or "discovery phase" (Poole et al, 2017), with an interview plan with questions to explore the sensemaking process and what are the associated concepts and issues (figure 3.2). These first interviews were analysed to determine what concepts were arising, and then they were further winnowed for the second

cluster with a theoretical sampling design, to further explore and probe those concepts and issues identified from the first cluster. Finally, the prototype conceptual framework of the process of long duration sensemaking was presented to five of the core members of the OSSAC for them to provide feedback and evaluate the product – a "confirmation phase of inquiry" (Poole et al, 2017). Further final probing questions were also asked for concepts that required some more clarity subsequent to the analysis after the second cluster of interviews.

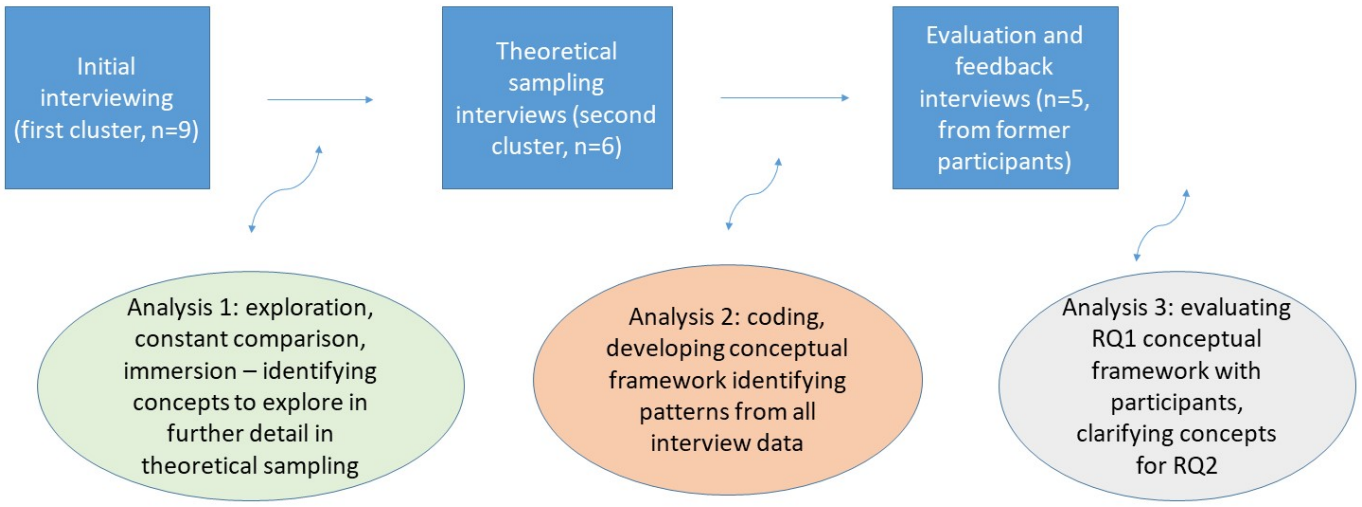


Figure 3. 2 Interview data collection and analysis design

Participant identification and recruitment

The Ontario Scientific SARS Advisory Committee (OSSAC) is the group of people being studied for this case study. The people who served on the Committee, as well as a selection of other stakeholders, such as people who were guest consultants, or were administrative support, or part of the team that formed the Committee, were also contacted and sent an invitation to participate.

The main source of identifying participants was Dr. Dick Zoutman's reflections on the SARS Committee (Zoutman, 2006), which included the names of experts who served on the OSSAC, as well as identifying other stakeholders. I searched for their contact details online,

and e-mailed participants to invite them to participate in this research. They could choose whether they would prefer the interview in person, via Skype or phone. There were some occasions where due to logistics, that in-person was not possible.

Each participant was also sent the research information sheet, detailing ethics approval, and their rights as participants.

There were 15 participants (Table 3.4), with their first interviews separated into two clusters. Five of those participants who served for a minimum of three weeks in SARS I were identified and requested to participate in feedback and evaluation interviews (the third cluster) of the conceptual framework. A total of 20 interviews were conducted, with a total of 264 pages of single-spaced transcripts.

Table 3. 4 Participant demographics and interview details

Cluster	Participant (code names used)	Interview date	Mode	Location of meeting	Memory aid	Transcript pages (single spaced)	Profession
1	Setterfeld	Oct 10, 2017	Skype		Yes	14	Infectious diseases physician
1	Barclay	Oct 18, 2017	Phone		Yes	11	Infectious diseases physician
1	Humphries*	Nov 2, 2017	In person	Hamilton, ON	Yes	20	Infection prevention and control practitioner
1	Potter	Nov 3, 2017	In person	Vaughn, ON	Other	11	other
1	Borjes	Nov 6, 2017	In person	Toronto, ON	Other	12	Infectious diseases physician
1	Pearce*	Nov 8, 2017	In person	Toronto, ON	Other	12	Emergency medicine physician
1	Goodman	Nov 24, 2017	Skype		Yes	13	Public health physician
1	Shields*	Jan 11, 2018	Phone		No	15	Infection prevention and control practitioner
1	Carnegie	Jan 22, 2018	Skype		No	13	Infectious diseases physician
2	Grahame*	May 31, 2018	Skype		Yes	13	Public health physician
2	Murasami*	June 4, 2018	Phone		Yes	16	Public health physician
2	McNamara	June 8, 2018	In person	Toronto, ON	No	15	Public health physician
2	Cove	June 29, 2018	Phone		No	13	Emergency medicine physician
2	Townsend	July 10, 2018	Phone		No	12	Emergency medicine physician
2	Murasami*	July 11, 2018	Phone		Yes	12	Public health physician
2	Lampman*	Dec 7, 2018	Phone		Other	12	Infectious diseases physician
3	Grahame*	Dec 11, 2018	Skype		n/a	14	Public health physician
3	Pearce*/ Shields*	January 29, 2019	In person	Toronto, ON	n/a	n/a [did not record]	Emergency medicine physician/ infection prevention and control practitioner
3	Lampman*	January 30, 2019	In person	Scarborough, ON	n/a	18	Infectious diseases physician
3	Murasami*	Feb 6, 2019	Phone		n/a	18	Public health physician

*served on OSSAC in SARS I for a minimum of 3 weeks

Table note: (when an infectious diseases physician also has other specialisations, I standardised by selecting infectious diseases)

Memory aids were developed, including diagrams and a timeline (Appendix 3.3). Not every participant was sent the same materials. The aim was to assist in participants' recollection of the SARS event more than fifteen years ago, and where a participant published relevant articles or other material, then that was sent for their information.

As I began the interview process, I noted that participants did not reference the memory aid (that I developed) during the interview. However, with the participants that were sent material that were in narrative format, they often recounted memories based on those narratives.

Due to these participants being very busy doctors and scientists, I did not want to send them extraneous material that was not useful for the interview as they are already volunteering an hour or more of their time. So with the first few participants not seeming to reference or use the memory aid in the interview, I decided to not send the materials to the rest of the participants in cluster 1. When cluster 2 started, I sent the memory aids to half of the participants; I did not find a remarkable difference between participant's ability to recount memories based on whether they were sent the memory aid I developed. Also, there were participants that were able to recall memories of events clearly and succinctly who did not review any memory aid.

Overall, I found the most useful memory aid was a narrative of the experience (this was classified as "Other" in Table 3.4's column on memory aids – n/a refers to cluster 3 being feedback interviews, thus a memory aid did not apply). Drs. Pearce, Lampman, and Ms. Potter all recounted memories based from the narratives they reviewed prior to the interview. Dr. Borjes was sent a scientific paper on SARS; I did not find that it was referred to, or that it informed recounting memories of serving on OSSAC, so I did not send any further scientific papers to participants.

An interesting discovery was the effect of a picture. Near the end of our interview, Dr. Barclay went through some old files and found a presentation recounting the OSSAC's day and it included a picture. Dr. Barclay exclaimed the names of the people sitting around the boardroom table and stated "It's bringing back memories."

Participant interview process

The SARS crisis occurred in 2003, at the time of data collection it was 14.5- 16 years ago; in order to elicit as rich memories as possible, I used oral history techniques in the interview. Leavy (2011) suggests listening for "markers" to clarify during a natural break in the interview session. Markers would include listening to the participant for "meta-language", such as when the participant stops and revises a previous statement during the interview. This may alert to a loaded memory which may be affected by the emotions and trauma of the crisis situation; the participant may be trying to access the memory, but may not be able to clearly verbalise it. Another marker is moral language, which would indicate the values of the organisational culture; for example, the "should" and "must" in responding to the public health crisis. The last marker to listen for is the logic of the narrative – does it flow, does it seem authentic? Finally, Leavy also states that data collection and analysis may not occur in a linear fashion, which is congruent with the iterative grounded theory method. Particularly with oral history where individuals are reaching back into distant memories, there may be follow-up interviews.

Also, as I conducted interviews, as I learned more, I tailored questions in succeeding interviews in order to pursue more deeply the issues that relate to the research question in the iterative discovery process (Rubin & Rubin, 2011). There was no need to ask the fifth participant the same question if the previous four had already provided the information, and saturated it; an example is finding out that directives had not been used before in the Ontario health system – SARS was the very first time directives were implemented. This is an abductive iterative method and served to maximise a limited participant pool, and an event from years ago.

Each interview was voice recorded, and I transcribed all of the interviews. One interview, with two participants, failed to record, and I was able to speak with one participant immediately after to recap the key points. For the other participant in that interview, I summarized the key points over e-mail, and received e-mail confirmation that it was correct.

Feedback and Evaluation Interviews

As described above, this study employs an iterative data collection and analysis design. After the second cluster of interviews were analysed, the framework developed for RQ1 was presented to a selection of the participants from both clusters 1 and 2, specifically recruiting those who had served a minimum of 3 weeks during SARS I – this is the "confirmatory phase" (Poole, Lambert, Murase, Asencio, & McDonald, 2017). Of the 6 participants that matched the criteria, 5 participated in the feedback and evaluation interviews (cluster 3).

The conceptual framework was presented over powerpoint to three people face-to-face; 1 person over Skype; and 1 person over the phone; the data from participants was recorded. The purpose of this meeting was to synthesise findings and present it to participants to see if they resonated; to get "confirmation" – was that reflective of their experience of sensemaking in the OSSAC? Another purpose was that in the act of presenting the findings, and hearing the participant's feedback in real-time, we again actively co-create rich data about the concepts, which is essential for RQ2. For several of the participants it had been almost a year since the first interview, so it was very interesting to hear their reflections as they had a clearer idea of what I am investigating, once I presented the conceptual framework. The co-creation becomes much more specific and deeper.

Data Analysis

Evolution of research questions, research plan, and research boundary

In the beginning, when this project was in the planning phase, it was envisioned the data would be fine-grained enough to be segregated into episodes and event units. This did not turn out to be possible, as participants' memories of an event more than 15 years ago do not

yield the detail needed for units to be reduced to episodes (episodes would be an individual sensemaking cycle for a directive).

Initially:

- Data was to be summarised into narratives, and this data was to be compared and analysed between episodes. This would have been an embedded case study design.
- For the event period (the entire SARS crisis), data were to be organised in narratives over 1-week units to map the process.
- News articles were to be mapped for topics over time, with episodes and events in a "temporal map" (see Appendix 3.4).

As the interviews progressed, data were not detailed in chronological sensemaking events as originally envisioned, except for the newspaper articles which are more reflective of "real-time".

For RQ1, which was originally the episodes (or individual directives), it changed into exploring the general process of developing directives. The specific analysis resulted in a conceptual framework. The data analysis is described further below in this chapter.

For RQ2, this originally included investigating the inter-relationship between episodes and the full SARS crisis event. As I cannot collect fine-grained process data of individual directives, RQ 2 has become an exploration of the information dynamics during a long duration crisis. There are still elements of comparison of the generalised episode (RQ1) and the evolution of knowledge over the entire SARS event, but not the fine-grained comparison initially envisioned.

The original analysis of the newspaper data of tracking in real-time has been adapted to corroborate other data in the findings chapters for triangulation.

Through conducting interviews, the data showed that the OSSAC developed directives throughout the weeks of SARS I. In SARS II, the final directive from SARS I was continuing in operation. During SARS II, the OSSAC did not create any new directives, they were

advising with less people, and meeting more by teleconference. Therefore, the research boundary is limited to SARS I only.

Constructivist Grounded Theory method and abductive approach

Charmaz stated that she is not providing a rigid methodology, or step-by-step recipe in Constructivist Grounded Theory; rather, it is a flexible guideline. In addition, Myers (2013) states that it is acceptable to use Grounded Theory Method (GTM) for data analysis, and another theory (the sensemaking "perspective" is being utilised) for the overarching framework for the study; the requirement being that the researcher is critical and creative.

GTM allows for continuous iteration, backwards and forwards, between data collection and analysis (Myers, 2013). While GTM methodologists differ on their stance of the role of a literature review, the main point is to not have preconceived theoretical ideas prior to starting research (Myers, 2013). This aids in the efforts of theoretical sensitivity: the ability of the researcher to gain insight from the data, to weigh the meanings gleaned from the data and be discerning about what is important to the research (Mills, Bonner, & Francis, 2006).

While there are apriori codes from the sensemaking perspective, and this is not a "pure" GTM, I immersed myself in the data and engaged in constant comparison between codes (both apriori and emerging) for rigor, transparency, and consistency. This aligns with the approach of Cornelissen and colleagues (2014) in their award-winning paper on acute crisis sensemaking: they follow a grounded theory strategy, with an iterative abductive data analysis. This doctoral study is also following a grounded theory strategy, while the sensemaking apriori codes and emergent codes form part of the abductive reflection and analysis between the clusters of data collection. Thus, this research project utilises deductive (apriori codes through literature review), inductive (emergent codes through iterative grounded theory method analysis), and abductive (iterative cycles of refining provisional codes) approaches in analysis and building theory.

Charmaz's steps for coding data are employed in this research study (2006), and are described below, and subsequently followed later in this chapter by descriptive examples of what was done per type of data:

1. **Initial coding** – Charmaz explains that the researcher should remain open to codes that emerge from data, while recognising we come with preconceptions from existing literature and theory. She states that the codes should be focused on 'action' and should be applied as quickly as possible in this stage. The aim is to keep codes short, precise; initial codes give possible paths to take the analyses (Charmaz, 2014, pg 138).
2. **Focused coding** – in this stage, the researcher sifts through all of the initial codes and looks for significant and/or frequent codes – coding is more selective, and these codes are often more conceptual than initial codes. These codes are applied to "sift, sort, synthesize, and analyze large amounts of data" (Charmaz, 2014, pg 138).
3. **Theoretical coding** – this step specifies possible relationships between codes established in the focused coding stage – these codes are integrative, coherent, and can assist the researcher in telling a story. Theoretical coding transitions to the next level of abstraction. The level and balance of application of previous knowledge (from the literature review) and emergence from the data is ambiguous (Charmaz, 2014, pg 150). This step looks at the 'big' picture and how the substantive focussed codes integrate and flow together.

   There are several iterations within this step; for each research question, an abductive concept map is drafted. The concept map is an initial "brain dump" of what is seen in the data from the cumulative progression of data analysis up to that point, of how the focused codes relate to each other. As the analysis progressed, the concept map also evolved; it is a constant comparison, iterative, dynamic process – it is theorising, as discussed by Weick (1995). Even as the relationships between concepts becomes clearer, it led to refining the concepts themselves.

Newspaper analysis

The specific details of the grounded theory analysis of the newspaper articles are in Appendix 3.5. Initially, the newspaper data was envisioned to be an equally important source of data to the participant interviews, as they provide real-time data that would enrich contextual understanding of the SARS period. Newspaper data were also thought to be a proxy for knowledge evolution through presenting scientific/medical and social science insights of SARS over time; these data could be extracted and mapped to show evolving knowledge**.** As I progressed through the data collection and analysis, I realised that the foundation of my research is the interview data. Newspaper data could show the evolution of knowledge by mapping the outcomes of experts' sensemaking, but could not provide rich data on the sensemaking process itself. One of the ways that newspaper data analysis supported this research was through corroboration of findings from interviews. For example, by analysing newspaper coverage of the Easter weekend cases, I was able to extract that data to build a richer case study, which included newspaper, interview, public inquiry reports and OSSAC meeting minutes data (see Table 4.8).

Newspaper data analysis was conducted first, prior to other data analysis, and this analysis set the foundation to understand the real-time context and unfolding of the SARS crisis. This was very important preparation for conducting interviews because the knowledge gained from newspaper analysis provided a solid base in building rapport with participants, and having a shared understanding of the historical aspect of the SARS crisis. I created a timeline with key events that became a memory aid in the interview phase (Appendix 3.3)

The findings of the newspaper analysis are not reported in-depth in this thesis, as the main focus is the interview data. However, the findings were presented at a conference in Wellington, NZ, and published in the Proceedings of the Information Systems for Crisis Response and Management (ISCRAM) Asia Pacific 2018 (Seto, Johnstone, & Campbell-Meier, 2018).

Newspaper data analysis looked at the national and international sensemaking of the SARS crisis. Due to the nature of newspaper data, it was not possible to follow the sensemaking process. However, it was possible to track facts – such as events that happened, and expert interpretations of those events, and map the changing interpretations over time. In this way, the paper presented three examples of the evolution of sensemaking over the SARS crisis period: the agent, transmission, and when people are infectious, based on national and international expert interpretations.

The findings of the newspaper analysis suggest:

1. PSM is tethered to RSM. KDMs need to make decisions based on their current interpretation of the crisis event (RSM). There is a risk of harm in interventions, particularly with the pressure to take action as quickly as possible, often with little information. In creating a response strategy (PSM), one of the risks is that the RSM was incorrect, and that the response may fail, or worse, cause more harm than inaction.
2. 'Fluidity of frames' – I am referring to the constant change in experts' interpretation of information. This occurred in all three long-duration sensemaking examples, the first example being the cause of SARS. Over the first few weeks of the SARS crisis, scientists around the world were not sure if the agent was a coronavirus, metapneumovirus, whether the viruses worked together, or if the real cause of SARS was neither virus. Newspaper data allowed a mapping of the sensemaking process, and how each interpretation is provisional, and dependent on gathering more information.
3. Learning through sensemaking. This is closely related to #2 – as scientists around the world gained more information, they are able to clarify their provisional sensemaking and gain more clarity and certainty in building the SARS frame. By mid-April there was consensus among WHO scientists that the SARS agent was a coronavirus. While #2 is referring to the provisional aspect of interpretations, #3 describes how it evolves, with greater information, to a higher level of certainty.

At the time of writing the ISCRAM paper (mid-year, 2018), over a year before completing the first draft of this thesis (late 2019), I did not have as much clarity in the concepts. But I see, in hindsight, how the newspaper data analysis and ISCRAM paper conceptualisations led to the expanded interpretation of interview data as presented in the Discussion chapter of this thesis. As a critical component of the newspaper analysis stage, I would memo insights or thoughts about data that I needed to consider further. Memos were both in written and diagram formats as I progressed in analysis. While I had not yet started interviewing OSSAC members, the newspaper journalists did interview experts regularly, and I was able to conceptualise further on the dynamic relationship between RSM and PSM. This was critical in my own research sensemaking as I progressed from the literature review, to the newspaper analysis, and then to the interviews.

The experience of newspaper data analysis was also very helpful in learning and practising coding for the subsequent interview data analysis. From the newspaper analysis experience, I found that it was not useful to code by process (trigger, bracketing, enaction, interpretation, plausibility) because separating the process out of the sequence stripped away its meaning. It was not useful to look at just the enaction process of several events – rather, I needed to code by event, and to look at the sensemaking process sequentially **within** that event, because the sensemaking process is contextual. By conducting newspaper analysis first, I was able to learn, and apply that to the subsequent phase of interview data analysis.

Interview data: iterative data collection and analysis

Between iterations of data collection, I engaged in constant comparison and immersion, to continually be connected with the data and to make memos throughout the process. The first cluster of interviews (figure 3.3) were conducted from October 2017 to January 2018.

Transcription, memos, and initial coding was completed by May, 2018. Memos were written during the initial coding period for key codes that may become focused codes. Any gaps in the data, or concepts that required further probing, were also noted for future data collection.

The second cluster of interviews were conducted in June and July of 2018. These interviews were more tailored to probe for the concepts arising from the first cluster, and to gather more information in the data gaps. After the second cluster of interview data were analysed, the conceptual framework resulting from RQ1 was presented to select participants for their evaluation and feedback in December 2018, and January 2019.

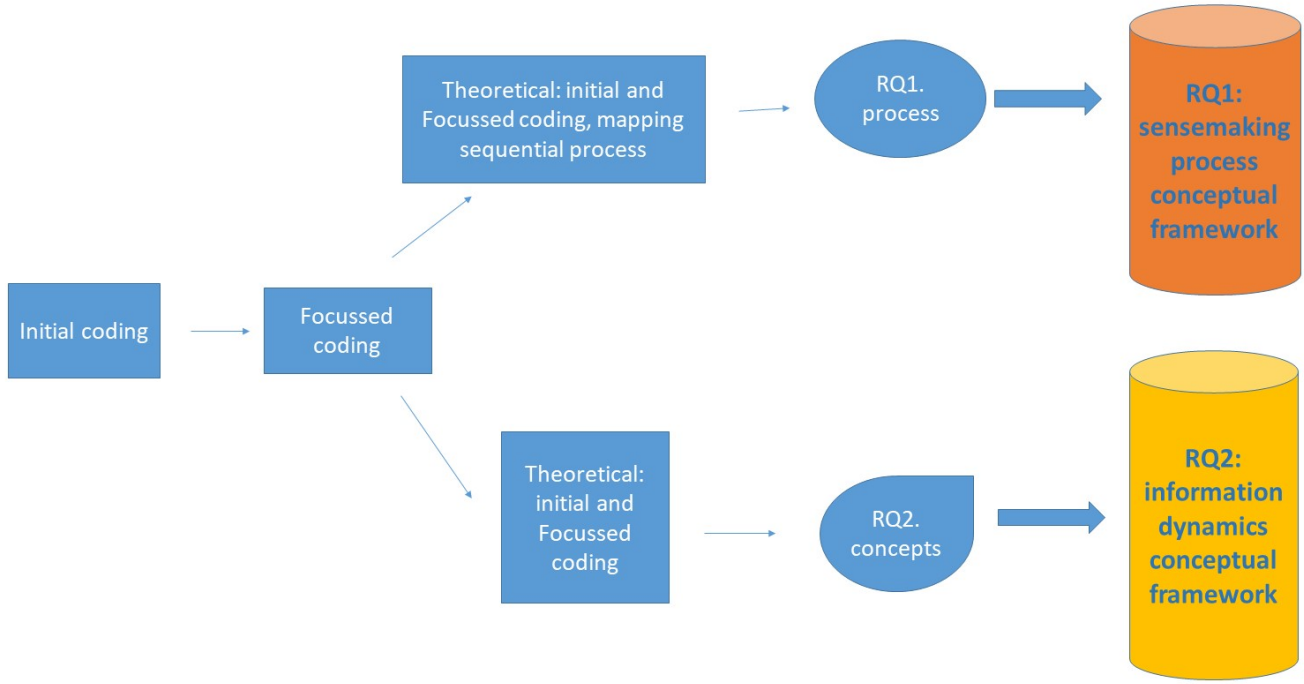


Figure 3. 3 Interview data analysis per research question

For interview data analysis, all the analysis is processed the same through initial coding to focussed coding and sorted in NVivo – then, depending the research question, the process differs slightly.

1.Initial Coding

Transcripts were placed into a table with two columns; the transcripts were in the left column. Each transcript was analysed line by line, and coded as much as possible with verbs to reflect process.

2.Focussed Coding

While Charmaz states that a helpful thing to do is to extract all the initial coding and "code the codes," I was uncomfortable with this approach as I wanted to see, viscerally, the linkage between the initial codes and the primary data. Perhaps something was missed during the initial coding stage, and having the visual cues of how I did the initial coding, beside the raw data, would offer provenance for the initial code being compared at the focused coding stage.

The abductive approach in this research study employs utilising apriori codes through the literature review (deductive), being sensitive to emergent codes (inductive), and carrying out iterative cycles of analysis with provisional codes (abductive) in the process of clarifying and refining concepts.

For the development of the focussed codes, there were three stages. See Appendix 3.6 for the detailed methods of focused coding development for interviews, and Appendix 3.7 for the focussed codes that were developed. These focussed codes were used in coding the transcripts in NVivo. Up to this point in the data analysis process, all the research questions share the same methods of analysis. After this point, there are some slight differences, as RQ1 is looking at process, and RQ2 is investigating information dynamics concepts.

Theoretical code analysis per research question

RQ1: Process analysis

When the focussed codes were developed, RSM and directives were separate codes, but it was through the process of analysis and as the conceptual framework was developed, it became clear from the data that RSM and 'directives' were part of a larger entwined process. This will be discussed in the findings section.

In designing the analysis for RQ1, there is the assumption that there is a general directives process that follows the same general sequential steps in the beginning of the crisis, to the end of the crisis. Also, as participants served at different points of the crisis and varying lengths of time, there is an assumption that they all had adequate exposure and experience to this general process, and that in the interview, they would be able to recall this process. Poole et al states: "when we have multiple cases of the same process, we may ask how similar various cases are in terms of sequential development. It may be that all cases unfold in the same way sequentially, supporting the hypothesis that there is a single, universal pattern in the process and explanations consistent with a single pattern" (Poole et al, 2017, pg 265).

For the directives code, there were 10 participants that yielded data that could be analysed for sequence. For the RSM code, there were 13 participants who could be analysed for sequence. Each participant's recollection of the process was laid out in a sequential map (Figure 3.4). These sequences were compared between participants, for some did not remember the full sequence of directive development. Then once the overall general sequence of the episode (one stream of sensemaking of directive development) was mapped, this was characterised as a "generalised episode" and visualised as the conceptual framework. The conceptual framework was pieced together like a sequential puzzle (Figure 3.4). For the detailed description, see Appendix 3.8.

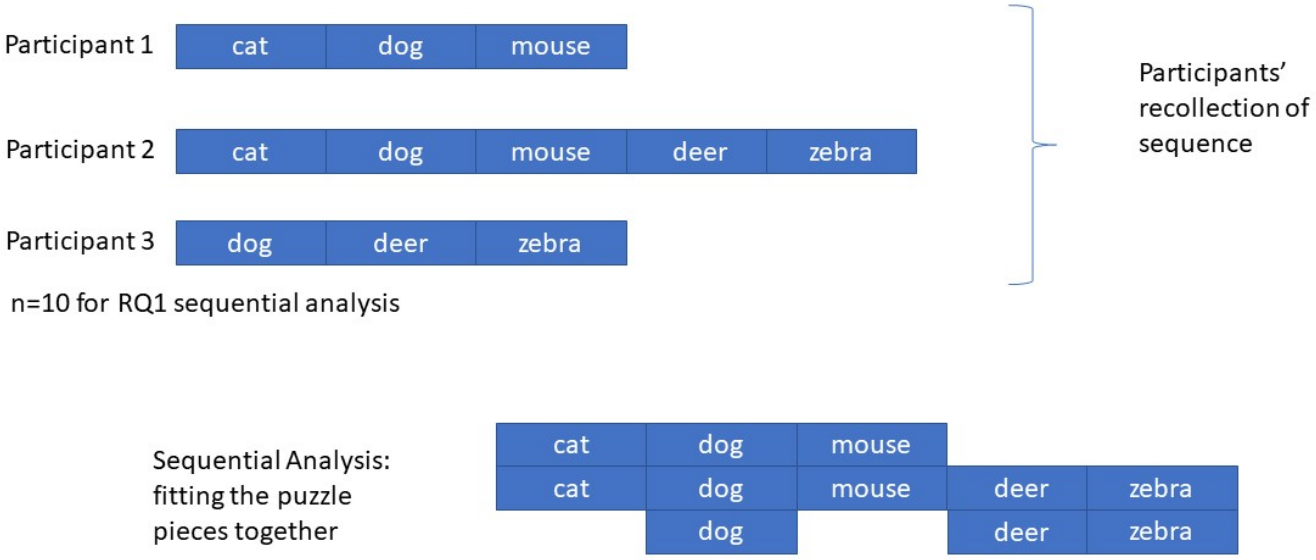


Figure 3. 4 The sequential analysis of directive development

Poole and colleagues explain: "Sequence analysis consists of three operations: sequence identification, sequence comparison and classification, and sequence characterization" (Poole et al, 2017, pg 268). They describe process analysis from organisational raw process data. However, I'm not directly observing process at a field site, but asking participants to recall their memories of the directive development process. They can't provide data for individual episodes in detail. So, the sequence is pre-identified by the participants in general (they are telling me, from their memory of the experience, what the process is). In my research, I do not do the sequence identification of raw process data, but match their memories like a puzzle, sequentially, and then engage in comparison and classification, and sequence characterization –resulting in the conceptual framework.

RQ2: Concept analysis

After focussed coding, the interview data is organised by the broader codes, and the data is extracted per code for further analysis. I have separated the analysis after focussed coding into three parts: Theoretical initial coding and theoretical focussed coding and theoretical

integration coding (see Table 3.4). At the theoretical initial coding stage, I start with immersion and comparison to keep the big picture in mind, and I drafted the abductive concept map for RQ2 (Figure 3.5). As discussed previously, this concept evolves throughout the process of analysis, but it is important to keep ideas mapped to track the process of theorising, and how it evolves.

Table 3. 5 The stages of theoretical coding

stage	description
Immersion	Immersion in the data within each code, notes created in comment boxes.
Theoretical initial coding	The data is placed in a table, in the left column. In the right column, I code again, in detail for key patterns or concepts within this code.
Theoretical focussed coding. Characterising each code	Reviewing all the data again, and the key concepts in the right column – the frequent and important concepts, relating to the research question, are extracted and placed at the top of the table, with extracts of relevant data under the concept. This is done for each code. Then, these key concepts are used to characterize each code; they form the substance of the code, and become the descriptors.
Integrating – relationships between codes.	All the key concepts for the codes are reviewed, and relationships between codes are described. This is an iterative process that is anchored by the concept map; relationships between codes are hypothesized early in the process (abductively), and through each iterative round of analysis, the relationships are examined, questioned, possibly modified, or deleted. Throughout this theorising process there is constant comparison, as the codes are constantly being considered, refined and reconsidered.

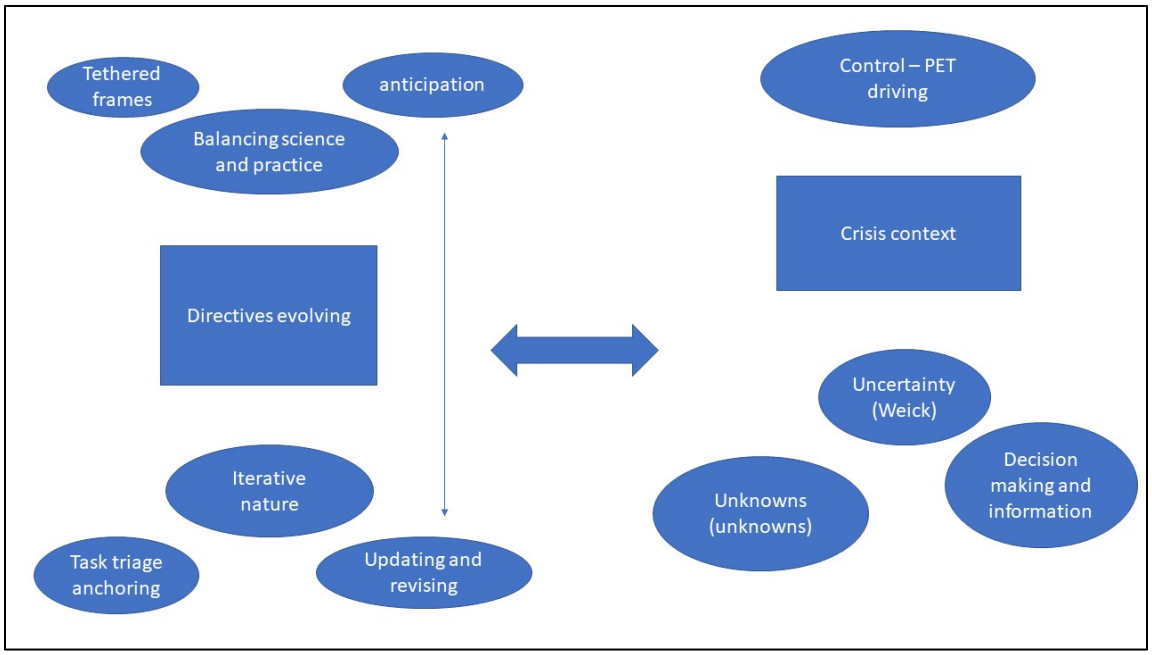


Figure 3. 5 First concept map

Since the first concept map there have been dozens of iterations, up to the current concept map, which is presented in the findings chapter for RQ2.

Feedback and evaluation interviews data (FEID) analysis

Once the analysis for RQ1 was complete, by the end of 2018, I went back to Canada to conduct feedback and evaluation interviews with five participants. As Poole et al. (2017) discuss, in process research there is the development of the sequence and patterns, followed later by a "'confirmation' phase of inquiry" (pg 261). I presented the RQ1 conceptual framework that depicts the sequential process of directives development to the participants, and recorded their feedback for analysis. RQ2 is about information dynamics, not about process, and the findings were not evaluated with participants; however, it was very useful to clarify concepts from the RQ2 analysis in this third set of interviews.

For Feedback and Evaluation Interviews Data (FEID) analysis, this was treated as a separate analysis as it was not the same as the first two clusters of interviews. The participants had already been through the interview process, and I presented to them the conceptual framework for RQ1, so it was not a qualitative interview in the classic sense, and I also asked them further questions to fill in the gaps discovered during analysis of the first two clusters.

Data were analysed separately, but with the same method as RQ1 and 2 for the conceptual data (see Appendix 3.9 for detailed description of analysis).

Data were analysed for two main purposes:

1. Revisions to the conceptual framework
2. Expanding or deepening the concepts in RQ1 and RQ2

Revisions to the conceptual framework were uncomplicated, and are discussed in the findings chapter for RQ1.

For the conceptual data, I found analysing FEID separately to be theoretically insightful. By having a separate batch of data that is on the same topic, but also at a much smaller scale, I am able to do constant comparison much more efficiently and effectively. This enabled me to gain some key insight, particularly in the relationship between RSM and PSM in the sensemaking process for developing directives.

Chapter 4: Findings for Research Question 1

RQ1: What is the general EAG social sensemaking process of creating and revising advice to KDMs during a long duration emerging disease crisis?

RQ1 Findings introduction

In this findings chapter, the results are presented of the analysis to explore how the OSSAC engaged in the process of developing directives during the SARS crisis. While in "real-time" the social dynamics are chaotic, complex, with multiple concurrent streams of sensemaking, this chapter presents a reductive linear generalised process. This helps us to understand, in general, what is the sequence of creating and revising a directive? In the next chapter, the dynamics are explored, with a more "real-time" approach (within the limitations of a retrospective case study) of the information dynamics in sensemaking.

Recall that the OSSAC is an advisory committee – their purpose was to provide advice, based on the best information available, and their own professional expertise in science and medicine. Dr. Goodman further explained:

> "The purpose was to…. So if we look at an emergency operations structure or an incident management structure, which is what we trying to get people to adhere to or to evolve into. We had a planning group, and what this group was meant to do was be a clearinghouse for the data that was coming in from multiple places …. The idea was, to be able to be a place where all of the intelligence, if you will, comes together so that we could have a consistent approach across the province." (Dr. Goodman)

As such, the cues they take in are information – Dr. Goodman refers to this as "intelligence" – (mainly in textual format or verbal format because it is information that has been retrieved from other groups, such as epidemiology or further information about a SARS case, or further information about equipment, etc), and that textual or verbal information

is the substance of their sensemaking. This is in contrast to other research on sensemaking, particularly in acute crises, which may be investigating sensory cues such as seeing, hearing, and feeling a wildfire (K. Weick, 1993) , or explosion (K E Weick, 2010), or the embodiment and physicality of sensemaking in pursuing a suspected terrorist (Cornelissen et al., 2014). Furthermore, other crisis sensemaking studies tend to look at decisions made as the crisis unfolds, whereas, the main decision-making body is not the OSSAC. This committee advises the decision-making body (POC), thus this research is looking at the sensemaking process of creating and revising advice, not decision-making in crisis response.

It is important to note that the work of the OSSAC was not limited to directives, they provided advice on many issues, and formats; an example, in Appendix 4.3, is forecasting scenarios (or "blue sky" scenarios) for the government on how the outbreak might unfold. This is different from directives, which are mandated policies for specific contexts.

Before the presentation of the findings, I will provide information on the context of the chaotic, complex, and dynamic socio-scape the OSSAC were operating within.

A snapshot of chaos and complexity

The emergency was declared on March 26, 2003, and the OSSAC were pulled together shortly after. Dr. Cove observes that were immediately thrown into a chaotic situation, where they responded reactively, in real-time:

> "I think this was built while the plane was flying. And that was clear they never had something like this occur before. And I would say everyone was unprepared for. And they had to build it as it progressed and new knowledge came in and new things were being developed, and even bringing the people together – who are the right people to bring together. Oh, so these people are showing up in the emergency department, so bring in some emergency physicians, oh … we need critical care physicians, oh we need infectious disease, oh we need public health. I think that it organically grew – as they saw what they needed, they added."

There was also no structure to support the chaos – there were no terms of reference for the OSSAC – even their roles and titles were ad hoc: "everyone was figuring out their role, day-by-day as they went along… everybody every single day was dealing with a brand new experience" (Dr. Townsend). There was immense stress and urgency, from the management in the POC to the HCWs in the frontlines. There were also fears that the SARS virus could overwhelm the system, as Dr. Brian Schwartz informed the SARS Commission during the hearings:

> "And I can tell you personally the weekend prior to Easter weekend and Passover weekend was very, very stressful for all of us in science committee and in operations, trying to deal with what we perceived was the beginning of a community-wide, or possibly the beginning of a community-wide outbreak."[22]

In this environment of stress, and urgency, the OSSAC were working as quickly as possible. Dr. Carnegie talks about the pressure: "You didn't have time. You just kind of sketched something out, and then bang, off it went. Because there was already something else shoved in your face that you had to deal with. It was pressure of a totally different kind… think about a hamster wheel – we were always trotting around a hamster wheel, trying to get this stuff out" (Dr. Carnegie).

On day-to-day level, often it was challenging to figure out what demanding issue to prioritise. There was a triage of priorities, stated by Dr. Brian Schwartz at the SARS Commission hearing:

> "We… often felt that we were dealing with multiple issues at the same time, getting the directives out, providing education or – or trying to get educational programs out to the users of these directives, dealing with support of operations, answering the questions …I think it would have been preferable to have a system and a process whereby we could clearly prioritize our material without having

[22] http://mail.tscript.com/trans/sars/oct_01_03/index.htm Dr. Brian Schwartz's presentation transcript of the SARS Commission Hearing – Oct 1, 2003. Starting on page 81 of the transcript. Accessed Nov 11, 2019

> to go back to the executive lead and say, we've got two … competing things we have to do; you tell us which one we have to address first"[23]

Setting daily priorities was the work of the Chairs of OSSAC, in conjunction with other leaders in the Operations centre. Things changed daily, even hourly, so even though there would be a plan at the start of each day, the plans could change: "it could be diverted by things that happened during the day, and so you would adjust" (Ms. Potter). Dr. Zoutman describes in his reflections: "Beginning each morning at 7am, we would list items in order of priority and then work at what needed to be done, disappear over lunch, work some more, and gather again at 4 pm to report on what we had accomplished" (Zoutman, 2006, pg 31). Often, the questions the OSSAC worked on came from "hospitals having teleconferences with Allison Stuart and others in the government to discuss what do we do if, what do we do if – this is what is happening now – and we would try to problem solve for them – what we would do. That would be very time consuming. She would come and say – today I need you to answer these 10 questions – away we go." (Dr. Lampman).

It is important to note that the sheer volume of information coming in could be overwhelming. One expert said he felt that the volume of information was "just coming in too fast and I don't have time to process it" (Dr. Grahame). There was urgency – time was a critical factor, and they needed to deliver product as quickly as possible: "everything was time-sensitive, so whether it felt completely finished or not, you had to come up with something, within a decent amount of time. So we were doing them, over the course of half a day. A full day at most, because these are … there were a constant list of requests coming in" (Dr. Carnegie).

Every day would bring new issues, and they would re-evaluate those issues against pre-existing priorities – and sometimes an issue was no longer relevant, and could be removed from the list, and other times an issue would become a higher priority (Dr. Lampman).

[23] http://mail.tscript.com/trans/sars/oct_01_03/index.htm Dr. Brian Schwartz's presentation transcript of the SARS Commission Hearing – Oct 1, 2003. Starting on page 81 of the transcript. Accessed Nov 11, 2019

Things were so urgent and changing so quickly that "most of the time was spent dealing with the practical questions coming in. As far as planning what was happening 2 or 3 weeks from now, no way. We were planning for what was going to happen in the next 24 to 48 hours" (Dr. Grahame).

The social context of the OSSAC was important as it gives a visceral sense of the urgency, pressure, chaos, and complexity of their situated workplace. Next, I will present the findings for RQ1; in the analysis, there were two main sequences that emerged – retrospective sensemaking (RSM) and prospective sensemaking (PSM). First, the RSM phase will be discussed, followed by the PSM. Then, the big picture of sensemaking iterations will be presented, with key concepts.

Retrospective Sensemaking (RSM)

To create directives, the OSSAC first must have an understanding of what the directive is created for. What is the threat? What information do they have, and what does the information mean? This is done through RSM, by creating meaning of what has happened so far in the crisis event, that is relevant to the creation of the directive.

In the Methodology chapter, I explained the details of the sequential analysis for the conceptual framework. The sequential analyses are compared from participants, and aggregated. Examples of the sequential analysis can be found in Appendix 4.1 (RSM analysis Example 1 and 2). The aggregated sequential analysis of RSM (Table 4.1) is provided in a summary table with examples, but this chapter will not expand in detail as there is abundant research on RSM (Maitlis & Christianson, 2014). RSM will also be discussed later in this chapter, when I present RSM to PSM iterative cycles.

Table 4. 1 RSM sequence

Characteristic	Example
Trigger	Experiencing the unexpected triggers sensemaking.

	At the OSSAC team level, multiple triggers happen throughout the crisis as they continually face new cues that were not expected, such as new cases, or unprecedented situations, such as the possibility of the virus becoming community-wide.
Bracketing	Once a trigger occurs, group attention coheres to the issue that caused the trigger – what is the gap in the frame that does not match the cues received?
Meaning creation	a. Enaction – gathering specific information to fill the gap identified in Bracketing Dr. McNamara explains that the OSSAC was seeking information to determine the incubation period, but that it was challenging because "many people have multiple exposures. … [we had to] find people who had individual one-time exposures, and then calculate… which we eventually did, we got the incubation period. But that was a big discussion point … because it determined the entire quarantine period."
	b. Interpretation – trying to build a story from the information (cues) that would fit the gap in the frame "we had not seen this before. So the question was, was it behaving like most other respiratory viruses which don't remain in the air for prolonged periods of time, vs something like a TB, which does. Or chicken pox, which does. And it makes quite a difference in how you manage things because if it's airborne, meaning that it can spread far and wide, then you need special air handling or negative pressure." (Dr. Carnegie)
Plausibility for RSM	Through meaning creation, they have developed a potential story to fill the gap, and they consider it for fit. For example, they considered the information they had on SARS, in the beginning, and decided it was most similar to influenza – "you have to go through that very methodical approach of – how is it being transmitted, what does it look like, it looks a lot like an influenza – so you start to use that as your model" (Ms. Shields).

The findings align (Figure 4.1) with what has been found in previous research on sensemaking (Weick, 1995).

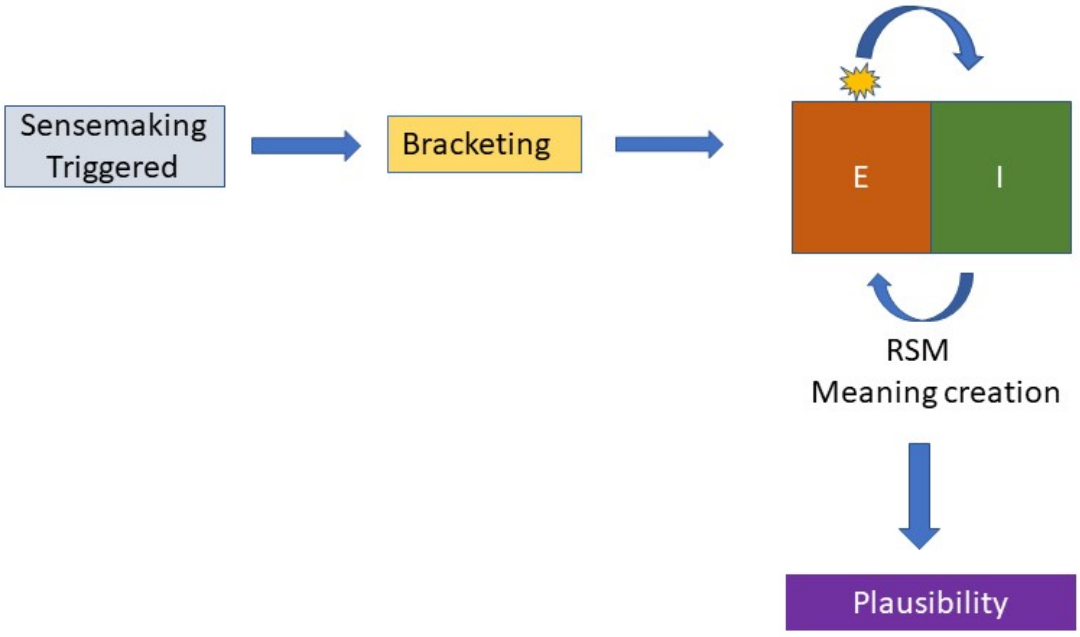


Figure 4. 1 RSM conceptual framework

Prospective Sensemaking (PSM)

In this section, PSM is presented. This is the process of creating and revising directives, where the OSSAC generate possibilities of the future, and create protocols (directives) that govern all aspects of hospital life (Ms. Shields). For examples of the PSM sequence analysis, see Appendix 4.2. The conceptual framework for PSM is below (Figure 4.2).

The act of creating (and some revising) directives is in the PSM. The sequential steps in PSM echo the steps in RSM –bracketing, meaning creation (enaction and interpretation), plausibility, and then iterating. The stages are examined in more detail following the conceptual framework for PSM.

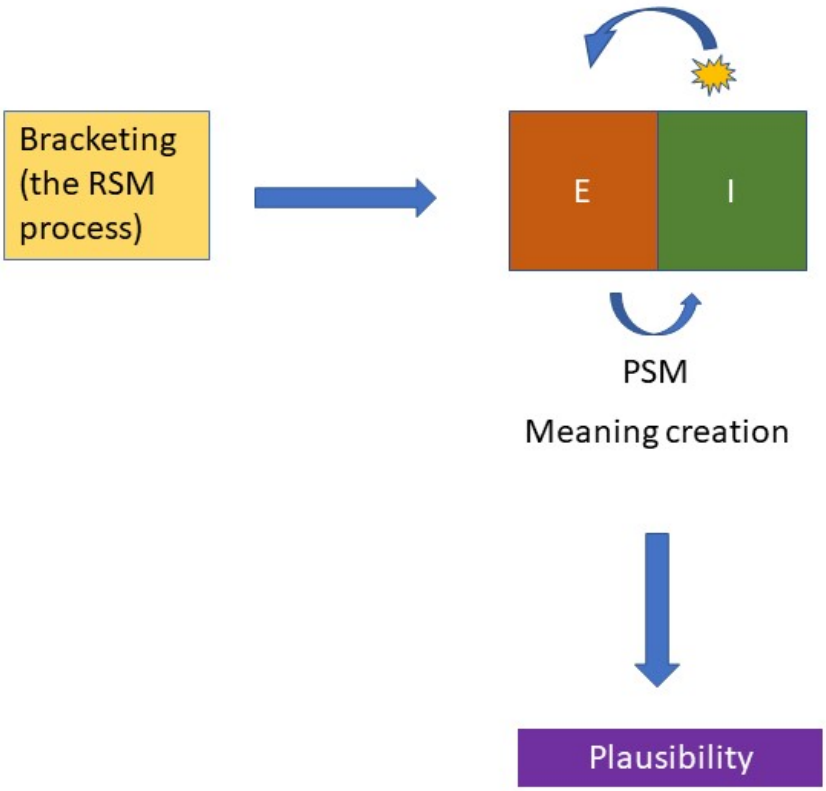


Figure 4. 2 Prospective sensemaking (PSM) conceptual framework

PSM Bracketing

Bracketing is the first assessment of the situation, and putting boundaries on social attention. In PSM, the bracketing stage encompasses RSM – where the OSSAC, in the face of the unknown, gather what information they have at that time: "you look at what you do know" (Dr. Barclay), and create meaning from that. As I was analysing the data, I realised that RSM is essential for PSM (but not vice versa), and they are tethered together – that PSM requires RSM in order to steer creating advice.

In the first few days, the OSSAC had to decide in RSM what the disease looked like, in order to start creating a directive. They must do this because there are only a few ways that transmission occurs, and there are specific protocols for each type of transmission (see Table 4.2). In RSM early in the crisis, they deliberated and built consensus on what disease

model to use in their planning: "you have to go through that very methodical approach of – how is it being transmitted, what does it look like, it looks a lot like an influenza – so you start to use that as your model" (Ms. Shields). After RSM, and having an "influenza model" to work from, they then transition to considering what resources (tools, existing policies, people to write) to use in creating the directives. The resources the participants discuss are both artefacts (such as existing guidelines) and professional/ personal knowledge (such as the understanding of "first principles" in IPAC and patient care). This is presented in the table 4.2 below.

Table 4. 2 Bracketing: marshalling resources

Bracketing: marshalling resources	Raw data examples
Using existing influenza and related guidelines to form a template and adapt for directives	"[We] said we have already written this, they are already here, why don't we use this. And this terminology. And I think we were much more familiar with the written documents than the vast majority because at the time if you asked there were not a lot of physicians who truly had expertise in infection prevention and control." [Ms. Humphries] "Because that's what we had, and we used that as the basis for the kinds of principles we would apply. Because they were tried and true, they weren't up for a lot of debate. And so, hand hygiene, droplet, contact precautions – you had something to relate to so you weren't starting - otherwise you were reinventing the wheel literally. We weren't up for that – we didn't have time for that." [Dr. Lampman]
Toolbox of standard protocols (infection control precautions)	the people who were consulting were all very familiar with infection control. There's a pretty standard approach to preventing transmission of infectious diseases in terms of how you handle a patient and provide care. It wasn't really developing new interventions. These were all things we did for other infectious diseases. … That kind of toolbox of things that

	you have were well known to people in infection control. [Dr. Barclay] "And you know that the – if it's contact, you want to wear gloves and gowns, if it's droplet you need something in front of your eyes [and] mouth. If it is small particle airborne you need a mask that is fit tested N95 respirator. And you want a system in which people are – the risk is that it is easily transmitted that you contaminate yourself while you are donning and doffing PPE. So now you're looking for a set of rules that allow, that get those PPE to people while minimising the risk that they are going to contaminate themselves in the process of doing that. And then you write your PPE guidelines." [Dr. Borjes]

A concept that emerged from the data was "first principles." Participants had varying terms for this: Standard approach (Dr. Barclay), first principles (Dr. Setterfeld), general principles (Dr. Goodman), basic underpinning (Dr. Borjes), basic principles (Dr. Carnegie). They refer to a canon of 'known' routines associated with a specific type of transmission (Table 4.2). This is professional knowledge of infection prevention and control (IPAC) practice.

PSM Meaning Creation

After bracketing, they start the meaning creation process, comprised of Interpretation and Enaction. Just as in RSM, Interpretation and Enaction are coupled – scenarios are generated in Interpretation, and when there is a gap in the scenario (such as not knowing what PPE would be best suited for the situation), they seek specific information (cues) through Enaction (such as consulting with PPE experts), which then feeds back into Interpretation (incorporating that PPE information in generating scenarios and writing the directive).

Interpretation is first characterised by the OSSAC generating scenarios, or considering scenarios that are sent to them by the KDMs, who received those questions from hospitals about "what do we do if…?" Dr. Lampman explains:

> "what if this spreads in schools? … what if a pregnant woman comes in and she's laboring. What do you do with the baby? What do you do with the mother? … They would come to us – what are we going to do in the emergency department screening, what are we going to do in the operating room, and then we wrote directives in answer to those scenarios that people had seen. Or that we felt were significant enough to warrant us writing a directive. We couldn't write a directive for every 'what if' because that's not possible." (Dr. Lampman)

They had to make decisions on what specific scenarios to write directives for; it wasn't possible, in a crisis situation, to spend the time to write protocols for every scenario generated. Dr. Grahame explains that the writing was done in small groups: "We all discussed the draft once it was ready, but the actual writing had to be done by small groups because it was just moving so fast."

Once scenarios(s) are selected for directive development, they go through the scenario step-by-step (Table 4.3).

Dr. Grahame also provides an example of generating a scenario, and how they created advice to limit the possibility of transmission during the Easter religious rituals:

> Well, the options were in some churches the grape juice or the wine is in individual glasses. That's not going to be a problem, it is single service.
> The wafers or the bread might be on a plate, and the problem there would be that when somebody's got SARS virus on their fingers and they go to reach for their piece of bread that they spread it to other pieces of bread. So we had to figure out what to do in that scenario. The biggest risk actually would be from the common cup, because the priest in the Anglican church, they wipe it off then they rotate it a bit, and then they give it to the next person to drink, and then they rotate it and so forth, so. If you are infectious, it is a good way to get sick. The alcohol content is not strong enough to instantly kill the virus that is being introduced into the gut.
> So just based on our experience, we considered the various ways that communion is served, and just came up for a general recommendation that the bread should be placed in individual containers, like if they have a little cup for the wine or the juice, they put a piece of bread in it – so they can take a cup of bread and a cup of juice. Or for the common cup – is to not do it. We couldn't

> say, don't do it. We could say, there's risk in it, and if you want to reduce that risk then just take the wafer and dip it in the cup, then serve yourself. So it was just based on our collective experience of going to different churches and seeing communion served in different ways.

Dr. Grahame's example shows that generating a scenario is a blend of personal experience and scientific/ medical knowledge in order to consider the step-by-step scenario of the communion, and where breaks might happen, and then recommendations to limit the risk.

Table 4. 3 Examples of a scenario step-by-step, in the Interpretation phase

Raw data example	Analysis
[patient] "When you are trying to isolate someone you first of all think about their placement, should they be in a single room or can they be in a room with other people. What's the handling of the air for the room – for an airborne disease you would put them in a negative pressure room, as opposed to a positive pressure room." [HCW] "You would think about what the health care worker has to do going into the room. First of all, you would think about – should pregnant women be able to go in. should people who are immunocompromised be able to go in. then what should they don, in terms of protective equipment. Should they wear eye coverings, should they … if they are going to wear a mask, what kind of mask – should it be a regular surgical mask, or should it be an N95 mask that has high efficiency filtration for small particles. Should they wear a gown, should the gown be water impermeable. What gloves should they wear, should they wear foot covering." [visitors] "Then you also have to think – are you going to allow visitors, are you going to allow the patient to go outside of the room for tests, or are they going to stay in the room – and so on." [Dr. Barclay]	Dr. Barclay separates the steps into three parts – thinking of how to handle the patient, then the HCW, and finally, visitors.
You had to break it up into steps.	Dr. Carnegie zooms in to a particular step within a scenario, and how much

[scenario]Say for example, one of the things was, what if a patient appeared at a smaller hospital, and they got really sick and you wanted to move them to a more specialised centre that had all the expertise or equipment that you needed. [steps]So you would need an ambulance transfer and you then would have to figure out the steps from, how do we get from point A to point B, how do you protect the staff on the way, what pathway should they take. … You had to figure out step-by-step how to get from point A to point B, for everything. Like putting on your protective gear. How do you take it off, without contaminating yourself. … you had to look at what equipment you needed for the staff, in terms of personal protective equipment. What kind of … if you could put anything on the patient, to prevent transmission – it basically was a mask. And then after they've left the area, how do you clean. [Dr. Carnegie]	detail they think of in creating directives.

Meaning creation is dependent upon the people around the table, and what knowledge and experiential frames they bring. This concept is the social library of frames.

Social Library of frames and the Social Desktop

An expert noted regarding the development of directives: "it is based on the people around the table, based on what we know and understand about, at that time, a respiratory infection" (Ms. Shields). The people around the table have their personal knowledge frames that they bring, and can verbalise into the social space. The Social library of frames refers to the collective frames residing among the experts present at any one time; when their personal knowledge is verbalised, it enters into the social space, or social desktop, where dynamic exchange of information among the group occurs. Dr. Setterfeld observes:

"People had different experiences. And that's what you want around the table. Some people would go – I think this is what we need to do – and most of the time you could articulate the past experiences that you've had as to why you think this is the thing to do." The social library of frames and social desktop apply to both RSM and PSM.

In writing directives, experts are needed who have the experience of patient flow and logistics within a hospital, in order to imagine the flow, and think of where transmission may occur, then consider ways to limit that possibility. Dr. Cove explains:

> "all the patients were being triaged to the emergency department. … how do you manage those people that may have been exposed to it, how do you isolate them, and do that management. And part of my role was to help them with it, and to provide advice. Same with the other emergency physicians there. So if a patient presented to emerg, we knew how the triage should work. How they should be identified where they should be placed. What the PPE being suggested would be." (Dr. Cove)

Dr. Carnegie is in agreement with Dr. Cove, "Well you have to have some kind of sense of, again, what is practical and what's not. So if you haven't worked inside a hospital at all, and you don't how things, workflow for example, then you weren't as much use- and again, that's where the makeup of your committee is important" (Dr. Carnegie). There were different professions represented at the OSSAC, including infectious disease physicians, emergency medicine physicians, IPAC experts, nurses, public health physicians, and others. Dr. Townsend observes: "I don't recall any other incident in recent history or memory that would have got all these different people together."

Dr. Carnegie noted that at one time, there were no other clinicians at the table, and she expressed her point of view from her clinical knowledge and experience – and adding that onto the active social desktop:

> The one element that I noticed that we did not have in the room was somebody who had a clinical perspective and it turns out that was me. Because some of the stuff we initially drew up wasn't practical, because most of the people in the room were not clinicians. In other words, people taking care of patients.
>
> …you have to remember there's a variety of disciplines represented, so medical microbiologists, are experts at dealing with the lab, but they don't actually take

> care of patients. You can come through the MD path but not do direct patient care. For example, pathologists, they don't take care of living patients. Radiologists don't do any bedside work. There's a whole bunch of different disciplines.
>
> I think I was one of the few people in the room that actually took care of patients. [Dr. Carnegie]

Another important point is that the social library of frames was not static; the OSSAC was comprised of volunteers who served varying periods of time, some came on and off sporadically. So, as Dr. Carnegie mentioned above, there was a time where there were no other clinicians at the table. Also, in the beginning, SARS was mainly seen as a hospital disease, and public health was not at the table. It was approximately a week into the crisis that public health physicians joined the OSSAC. Dr. Murasami notes:

> "the make-up of OSSAC – when it was created I think it was seen as an infection control problem. So the infection control experts were brought in. There wasn't a lot of connection between infection control and public health. … it was almost like two separate worlds. One of the things – because public health was not involved in infection control at the time. We were beginning to be involved in outbreaks in long term care facilities … It was subsequent to SARS and pursuant to the recommendations that public health departments developed expertise in people actually certified in infection control' (Dr. Murasami)

Bricolage

Bricolage is taking existing frames and adapting them to the situation at hand. The OSSAC had to do this regularly because there are no existing protocols for SARS, and there were many questions that came in they had not faced before. Bricolage is also a function of the people at the table and the library of frames available to be adapted.

Ms. Humphries explains:

> "there were so many things that happened that there were no guidelines for. You had to take something and adapt a policy or a general best practice approach to it. And one of the examples was when there was transmission at one of the funerals of one of the religious groups that our index case was part

> of. When she passed away and all the people came together at the funeral, her son was already sick. And there was transmission. So then there was the whole – how do we manage the situation, what do we – what else do we have to do – should we be shaking hands in church, what about the host, how is that all contaminated. So providing guidance or in a setting that had never been asked for that kind of guidance before. We had to think about, ok, what is this going to look like." [Ms. Humphries]

Another example is PPE. One of the issues the OSSAC were regularly debating was protection for HCWs. Even after implementing directives for the first few weeks, there were a shocking number of new cases over the Easter weekend. This caused another discussion, on how to increase the level of PPE (because it was assumed that was the best way to limit further transmission). Dr. Pearce explains that they were talking about N95s (a mask), and then considered Powered Air-Purifying Respirators (PAPRs) – which they were going to start using in critical care settings – but then they realised they didn't have enough of those, they then considered Stryker suits:

> "A Stryker suit is a full body suit that orthopedic surgeons wear when they do operations inside joint cavities. If a bacteria gets inside a joint – you know its one thing to get a wound infection after surgery – you can fill it full of antibiotics. But if you put a prosthetic joint in – a hip replacement – and it gets infected – basically it destroys the entire joint and you can't fix it.
>
> So the risk, the impact of an infection, in an orthopedic procedure – I think it is high everywhere – but it is even higher in that situation. You can't fix it with antibiotics or anything. So they developed these suits to protect the surgical site from bacterial contamination from the surgeon. Somebody thought – well, if it works so well in protecting against infection one way, maybe it will help protect the health care worker from the patient. There's no basis. There's no scientific basis to support that – its never been tried. To my knowledge it hasn't been tried. Somebody came and said – maybe this will work. That would be rational conjecture. And I feel so silly talking about it now, because it seems so bizarre that we were actually practising medicine and infection prevention and control on real patients by doing this. But that's the state we were at in terms of trying to come up with something that might work. [Dr. Pearce]

Dr. Pearce's reference to "rational conjecture" is bricolage – taking something they know, and adapting it to the situation they were considering.

PSM Plausibility

After the Meaning Creation stage, and the directive draft or revision was ready for team consideration, that is the PSM plausibility stage. The PSM plausibility is driven by urgent deadlines – the OSSAC would work on the draft until the deadline and then send it on. Dr. Pearce illuminates this:

> So, we would develop all these and basically they were done to deadlines. So, Allison Stuart would come to me and say, I need a draft by 11 o'clock tonight. And we would work till 11:01, and whatever we had would go to them and they would look at it from the operational standpoint, and send it back - this isn't consistent with the last one you wrote and they would send it back. We would go back and forth. And then it would get to a stage where they felt that they could present it to Dr. Young and Dr. D'Cunha. I think they were co-signed by both of them, the directors, the directives. [Dr. Pearce]

In the Naylor report (2003), they further explain that when the directives were passed 'upstairs' to Operations (the Director of Hospital Operations was Allison Stuart), they "reworded them to facilitate implementation by administrators, or, as the team called it "translation into 'Hospitalese'" (Naylor, 2003, pg 30). Participants in this research, as well as informants of the Naylor report, observe that there was no stringent document control, as the versions written and approved by the OSSAC would sometimes look very different from the directives issued by the POC, and this could be confusing for hospitals. The PSM plausibility stage encompasses the cycles of passing back and forth between the POC and the OSSAC. It was the responsibility of the POC to send the directive to the hospitals for implementation.

One participant recalls that sometimes after they sent the directive to the POC, they wouldn't get feedback – and it seemed as if the directive had gone into a "black hole."

Dr. Borjes remembers:

> "they made decisions and sometimes they listened to the science and sometimes they didn't. … A few times they did things that we thought were so stupid, that we went back to them and said no, no, no, you can't do this. And sometimes that worked and sometimes it didn't. From the perspective of OSSAC there was a black hole between the scientific advice as written and goes forward, and then the directives are produced… And most of the time, maybe there just wasn't time enough to worry about it."

Iterations of sensemaking cycles

> At the time you really are going with the cumulative information that you've gotten, and sometimes it's gut feelings. Particularly with a brand new disease. When we deal with stuff like influenza, we have a lot of back information that tells us what we should do even if this strain may be different.
>
> But with something that is brand new, you just have to go on a lot of times what your gut feeling is about what its going to be. Each case that happens, there's a lot of dissection about what happened, and you learned from each case. Cumulative experience – I guess that would be the way I would put it. (Dr. Setterfeld)

After the directive is implemented in hospitals by the POC, the health care workers (HCWs) provide feedback on what works and what doesn't work in that directive. This information is received in the RSM bracketing stage of a sensemaking iteration. Once the team has gathered this information from the front lines about what doesn't work, and why, then they enter the meaning creation stage as they process that information and determine if/how they can revise the directive.

Finally, when a directive has no feedback for revisions or changes, and is in the last iteration – then it becomes a stabilised part of the SARS frame. The last directives were signed off by the OSSAC, and they disbanded by May 16 2003[24].

[24]http://www.archives.gov.on.ca/en/e_records/sars/hearings/03Wed.pdf/Wed_12_45_The_Ontario_SARS_Scientific_Advisory_Committee.pdf From the powerpoint slides from Dr. Brian Schwartz's presentation for the SARS Commission hearings. Accessed Nov 11, 2019.

Drivers of iterations of sensemaking

The drive for iterative cycles of sensemaking originate in RSM. Information from epidemiology reports, unexpected new cases, feedback from HCWs about the directives – these are all cues generated from the environment, including the greater health system, that are funneled to the OSSAC, and processed through RSM.

Ms. Shields provides an example of RSM, from the trigger to meaning creation:

> Where things shifted, where we had new cases and transmissions, all of those things might warrant a revision. Sometimes they were very minor revisions, sometimes they were significant in terms of.... Maybe it was something significant around specimen collection, or a major practice issue, that sort of thing. Cleaning protocols. So we may, a lot of stuff was based on the new case that was identified and then we would go in and talk to that hospital, and the key people on the ground, find out as much as we could about the case and where transmission may have occurred.
>
> So for example we had a conversation around how much the environment played a role in transmission, and whether or not we had to change – how could we get the burden of, in this case, virus, the bio burden down in a room.
>
> And we looked at cleaning protocols and what they should be cleaning with. And whether or not we needed to change that. So that played a lot into revisions as well.

Extending this same example, Dr. McNamara explains about the information seeking (Enaction) to investigate the "bio burden":

> "I remember there was some discussions ... did it build up on surfaces and did you reach a critical level and they were having discussions on environmental cleaning and how much environmental cleaning... well, we were seeing transmission in the hospitals, they wanted ... data to say whether it was from a person-to-person vs could they get it off surfaces. Of which, did we have any cleaners coming down with it, what was the nurses, health care workers, and we were looking at what about people in their homes, how was it being transmitted in their homes. Some of the health care workers, their families got sick. So, how did that get transmitted. We were always looking into these things."

Example of sensemaking iteration (the Easter weekend)

Some cues in RSM are deemed to warrant creation of new directives, or to revise existing directives, and are transitioned to the PSM stage. This will be presented in the Easter outbreak example below.

Ms. Shields recounts that weekend:

> "…the point where I was asked to come in, that Easter weekend, the reason that they realized they needed to do a lot more of, I guess, review monitoring of all of the practices, and they needed more hands on deck. They became aware of health care workers who were deteriorating, supposedly while wearing the PPE.
>
> So that of course frightened everyone, and of course not knowing what we were dealing with yet, not having really identified the virus, then people start to think, oh - it is not just respiratory droplet spread. Perhaps it is airborne. And, what does that mean? So siding on caution meant that a lot more precautionary measures were implemented." (Ms. Shields)

As Ms. Shields explains, the new cases 'frightened everyone' and drove RSM – increasing the consideration that SARS was potentially airborne, and not just droplet transmission.

This particular example begins when the OSSAC receive information of 11 new HCW cases (between April 15-19).[25] In the table below (Table 4.4), I follow the sequence (in general) of the social sensemaking during the Easter crisis, stemming from the 11 new cases. I draw on participant interviews, the SARS Commission, and other archival data. I reiterate that this PhD study is on the social sensemaking process, not examining responsibilities or culpability. As the SARS Commission states, the Easter cases were a result of inadequate systems.[26]

[25] SARS Commission, vol 2, page 401
[26] SARS Commission, vol 2, page 411

Table 4. 4 Easter example of sensemaking iterations

RSM: Enaction	RSM: Interpretation
	1.With the new HCW cases, the Influenza model seemed "fragile" (Ms. Shields) – the directives were written based on an influenza model, and the 11 new cases were unexpected and "frightening." They discuss how it might have occurred, but felt "stymied" (Dr. Grahame) – there must have been a "break" somewhere. At that point they did not know it was due to a difficult intubation that sprayed "little red droplets" on many HCWs, on April 13, at Sunnybrook Hospital.[27] Dr. Lampman notes that they reconsidered whether the transmission might be airborne. In an influenza model, it is droplet transmission.
2.On Friday April 18, 2003, they decide to call in external assistance (this is not solely the decision of the OSSAC – but all in the crisis response management were in agreement): "We need fresh bodies to come in and look at this because we do not have the time to do it, and our health care workers, we have to do it for them, we need somebody fresh to come in and their only job is to come in and work out this problem	3.A newspaper reported that by April 20, they had enough information about the HCW cases to suspect they were due to the intubation on April 13: "The exposure of Sunnybrook staff to SARS is believed to have occurred a week ago when doctors, nurses and a respiratory therapist were struggling to insert a tube down the throat of a patient with SARS. "The physicians, nurses and respiratory therapist had a difficult time getting the patient intubated and stabilized," said Dr. Mary Vearncombe, head of infection, prevention control. The procedure,

[27] SARS Commission, vol 2, pages 393-400

with transmission to health care workers through precautions."[28] On April 22, the team arrived, comprised of a hospital-infection-control specialist, an industrial hygienist and an epidemiologist from the CDC; they are joined by two experts from Health Canada.[29]	which involves inserting a tube down a patient's air passage to facilitate breathing, took "four full hours.""[30] The OSSAC decide, in the interim, that the best course of action is to increase the level of PPE (Dr. Pearce). This will be a revision of a directive and will require planning and transitions into PSM.
PSM: Enaction	**PSM: Interpretation**
	1.By April 21 (Minutes missing from April 18-20. Published reflections show that they may have taken a few days off for Easter (Zoutman, 2006)), they had drafted revisions to the Directive To All Ontario Acute Care Hospitals regarding Infection Control Measures[31] - they continue to work on these revisions, as reported in their April 23 minutes. A newspaper reports that on April 22: "Hospital staff working in Toronto-area SARS units will now be double-gloved and wear full face shields as concerns grow that the gear used so far has not been enough to protect health-care workers. Workers now wear masks covering the mouth and nose as well as protective goggles when they enter SARS units. Under the new protocol, they will have

[28] SARS Commission, vol 2, page 401 – hospital official cited
[29] Perkins, T. U.S. experts eye Toronto regimen, *The Globe and Mail*, April 23, 2003
[30] Powell, B., and van Rijn, N. SARS hits units at key hospital ; Areas closed after 4 staffers get sick at Sunnybrook 14th victim dies here, 12 die in one day in Hong Kong. *Toronto Star*, April 20, 2003
[31] OSSAC minutes, April 21, 2003, page 1

	to wear their masks along with shields covering the entire face. They will also be urged to take more breaks and work shorter shifts to avoid mistakes that could lead to exposure. The hospital rooms of SARS patients will be disinfected more frequently."[32]
2.Consulting with experts in PPE They considered Stryker suits, and PAPRs, and sought external experts to advise: "not every place had these suits so we actually had someone come in from a facility to demonstrate what they looked like and how they would work" (Ms. Shields). On April 28, they had an expert present on PPE, and were considering the 3M PAPR Hood, Stryker T4 System, and Full face respirators.[33]	3.Even with the deliberation and the drive for higher PPE: "In the end, it was very practical – what do the hospitals have – what equipment do they have that might be equivalent to a PAPR… because it needs to be implemented immediately" (Ms. Shields). The first directive issued by the POC on how HCWs who participated in intubations could protect themselves was issued April 29, 2003. Those were interim directives, and superseded on May 1, and May 13, 2003.[34] See Appendix 4.4: "Interim Directives to all Ontario acute care hospitals for high-risk procedures in crucial care areas during a SARS outbreak" – dated April 29, 2003

It is important to note that in discussing PPE, they do not always have full agreement. They were not in agreement over N95 masks: "many of us were concerned about bringing in, because that required fit-testing. The PAPRs, many of us did not think that epidemiology was telling us this was airborne. We felt that it was introducing new equipment not well

[32] Alphonso, C. Double gloves and full facial shields ordered in units handling Toronto cases. *The Globe and Mail*, April 22, 2003
[33] OSSAC minutes, April 28
[34] SARS Commission, vol 2, page 410.

used in the hospital, making patient care cumbersome, so that was one of the unintended consequences." (Ms. Shields). Also, there were concerns about HCWs being afraid to go to work; which also was a strong factor in raising the level of PPE (Dr. Lampman).

Plausibility and attenuating sensemaking

There are plausibility steps for one cycle of RSM and PSM, and at the level of iterations of a directive, there is the plausibility of the final version. Once there are no more cases after two incubation periods, and no significant feedback that the OSSAC deem to merit further changes, then the directive is finalised as part of the SARS frame.

The plausibility of directives depends on stopping transmission; if there are no new cases after two incubation periods, then the purpose of directives, and implementing control measures, has been achieved. Dr. Setterfeld explains: "if you see everyday 4 or 5 more cases of people getting it transmitted in the hospital – you make a change and you continue to see 4 or 5 cases – and then it drops – then you've got evidence to show you that that change was important."

By April 25, the OSSAC were discussing the development of criteria for lifting the emergency declaration.[35] A few days later, their activities include transition planning.[36] As they reached the end of two incubation periods (20 days), the OSSAC were drafting transition documents to bring the system to the "new normal" and is a substantial part of their work in May. In a letter issued from the POC on May 13, they state:

> "The new normal will be characterized by high standards of practice that reflect a heightened awareness of emerging infectious diseases including SARS. Goals of practice are the prevention of exposure, early detection of new cases with appropriate management, protection of others in the community and health care setting, and full and appropriate management of those individuals with

[35] OSSAC minutes, April 25.
[36] OSSAC minutes, April 28.

> other health care needs… [directives developed for the "new normal"] take effect as of 0800 hours on Friday may 16, 2003."[37]

Dr. Setterfeld sums up the iterative long duration crisis sensemaking process:

> "as people were following guidelines and getting infected then you have to stop and think, how is that happening? … So you work your way through the steps, and if people were getting infected and were covering themselves with the gowns appropriately, they were using the masks appropriately, they were using eye protection appropriately, then you run into the only two ways they could get it is that they are breaking the technique when they are in the room with the patient. And most people will remember if they've done that or somebody else will point it out, and the next most obvious place is they are contaminating themselves as they take it off so we need to be careful of that.
>
> In a way, you learn from where things went wrong and you look at what might be the most likely reason, to correct it, you put in those corrections and if you have no more cases then you were right. If you still have cases then you have to look for something else."

Meaning creation in RSM and PSM

The directional drive of meaning creation within RSM and PSM are different (Figure 4.3). RSM meaning creation stems from enaction, to generate cues, which are then interpreted. In PSM, scenarios are generated first (such as implementing higher levels of PPE), then further cues are sought to 'flesh out' the scenario (seeking PPE experts to consult).

[37] Ministry of Health and Long Term Care: Provincial Operations Centre. Letter issued May 13, 2003.

Interpretation (through social discussion and deliberation)

RSM	analysing data: imagining what might have happened
PSM	projecting and planning: imagining what could happen

Enaction

RSM	Decision-making on action, searching for more information/ data
PSM	creating a tangible product (artifact), codification of a plan.

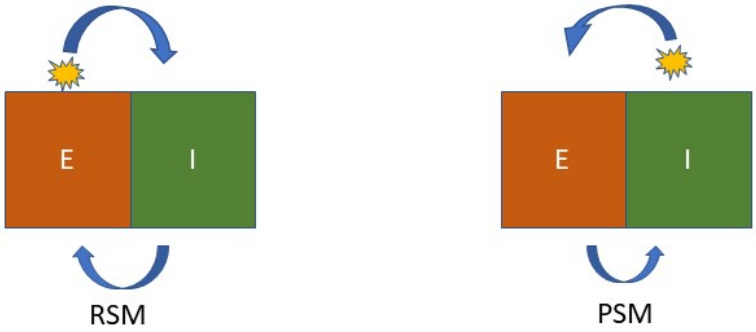


Figure 4. 3 Meaning creation flow for RSM is different from PSM

The conceptual framework for EAG sensemaking through a long-duration crisis response is comprised of the cycles of RSM and PSM presented in this chapter (Figure 4.4). In RSM, meaning is created from cues informing the directive development. At the RSM plausibility stage, there are four possible directions. The team may: (1) move into building scenarios in PSM, or (2) back to the bracketing stage if the sense being considered require further RSM. If the cues require a revision to a directive, but not future-oriented thinking such as building scenarios, then the directive may (3) be revised and implemented in the field without PSM. Another possibility is that (4) they have reached overall plausibility for that specific directive (for example, for the acute care directives, two incubation periods have passed with no new cases in hospitals), achieving a stabilised completed directive and the attenuation of that sensemaking stream.

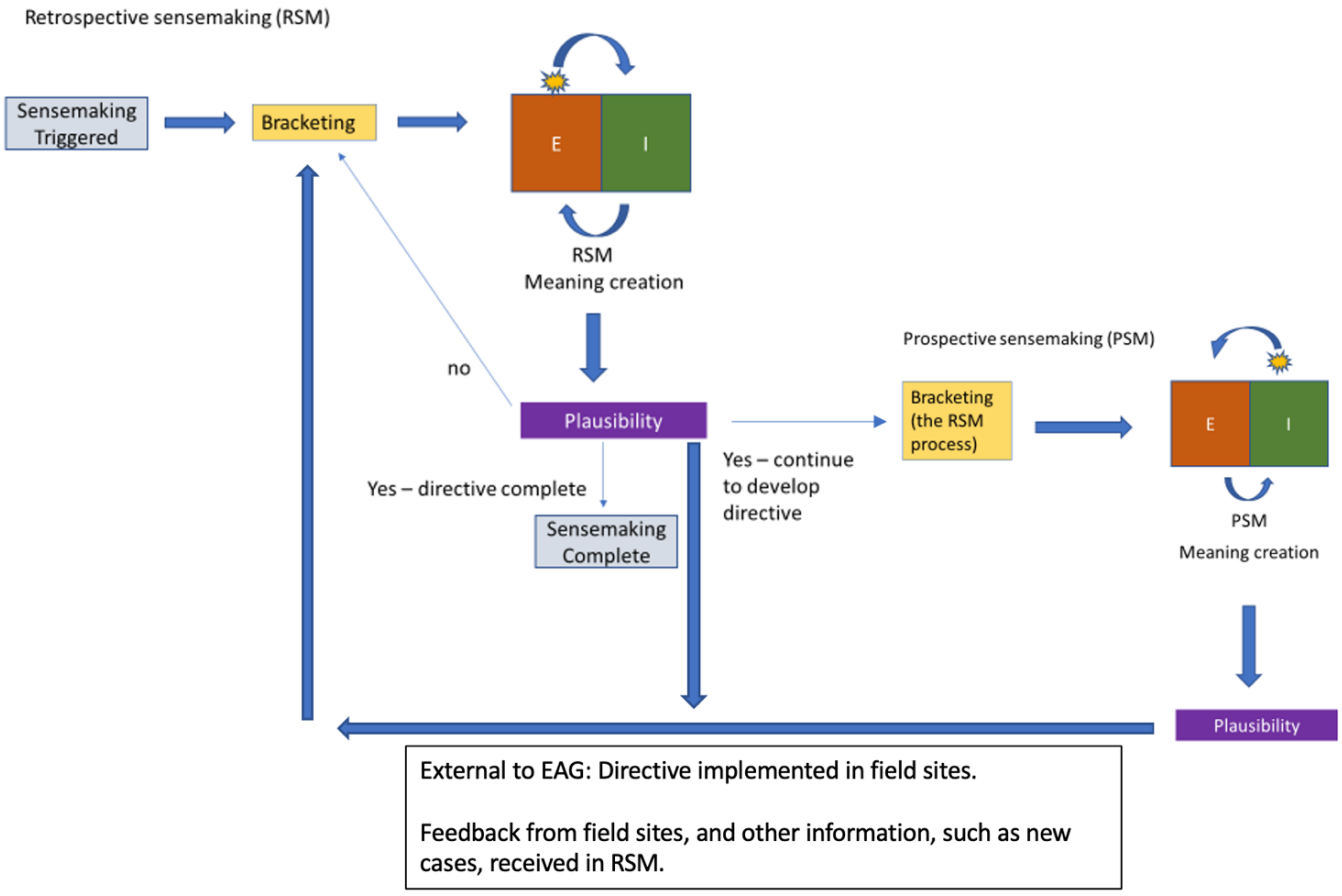


Figure 4. 4 Conceptual framework of EAGs social sensemaking through a long duration crisis response

Feedback and Evaluation Interviews: results

The five participants all gave positive feedback that the conceptual framework aligns with their experience as part of the OSSAC. One participant said that the linear structure does not account for the chaos and complexity of real-time sensemaking, and that sometimes in a crisis situation, an individual must act without full consideration of information. As stated in the beginning of this chapter, the conceptual framework is linear to provide a general diagram of the sequence in sensemaking; I acknowledge that real-time crisis sensemaking

does not look like this. The chaos and complexity of real-time information dynamics is explored more in-depth in the next chapter, for RQ2.

In this chapter, the conceptual framework for the general process of social sensemaking in creating and revising advice to KDMs was presented, from the perspective of the expert advisory group.

Chapter 5: Findings for Research Question 2

RQ2: What are the information dynamics of long duration social sensemaking from the EAG perspective during an emerging disease crisis?

RQ2 Findings Introduction

RQ1 was a sequential, linear reductionist conceptual framework of the social sensemaking process of an expert advisory team, working to create and develop advice for key decision-makers. RQ1 provided a sequential process; in this findings chapter for RQ2, I delve into the information dynamics of the sensemaking process. Our view in this chapter is multi-directional (as opposed to the linear view of RQ1) and contextual. This chapter is about the movement of information: received by the OSSAC, processed within the OSSAC, as well as information they actively seek, and information they send out.

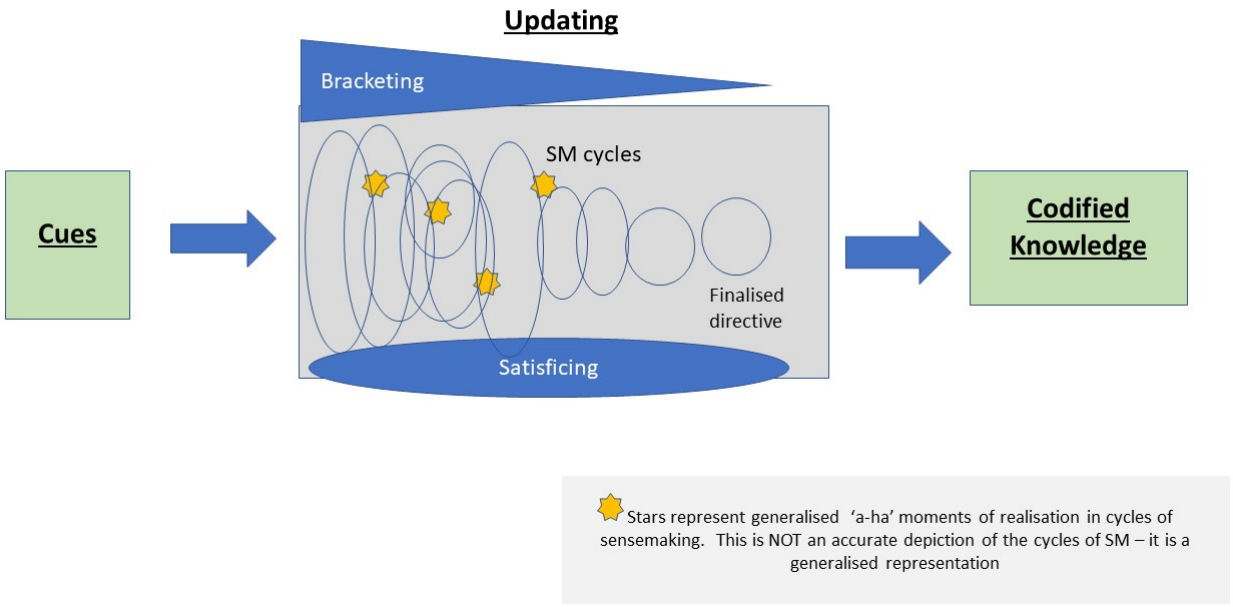


Figure 5. 1 Conceptual framework of information dynamics in long duration crisis sensemaking

The conceptual framework (figure 5.1) provides an overview of the contents of this chapter. I will first discuss the unknowns the OSSAC faced – they received a high volume of cues, and many of them were not easily matched to existing frames, as SARS was an emerging disease. The cues represent a multitude of unknowns for the OSSAC (and the entire health system). In the centre panel of Updating, the big picture of iterative sensemaking throughout the crisis period evolves (this is represented by the multiple circles of different widths and heights, signifying different intensities and durations of sensemaking streams). Satisficing is a concept within the dynamics of sensemaking, reflecting the pulls on the developing directives – science, the sociopolitical, and the practical – which may sometimes pull in opposing directions. Bracketing is the attention coherence of the team, which constantly changes throughout the crisis period. The chapter will conclude with discussing Codified Knowledge, which is external (social), written or verbalised knowledge, represented by directives.

Unknowns

> "You don't know the method of transmission, you don't know the incubation period. You don't know whether people are contagious before they show symptoms or not. That's a really important thing to know because that helps determine whether quarantine is useful or not. And, you know, what advice to give people. And you don't know how to treat it, you don't know what family of viruses it's in. if it's a virus. It's just very, very, difficult, and you need the best – the fastest and the best epidemiological work, surveillance and epidemiological work, so you can start to get a handle on those things" (Dr. Murasami).

Within the process of social sensemaking, the data suggest there are four types of unknowns – organised in two sets – unknowns stemming from what has already happened, and unknowns that are yet to happen. First, I will discuss unknowns from events that have

happened (RSM), then I will discuss unknowns generated by future-oriented sensemaking (PSM).

There are two types of unknowns in the process of RSM, which will be summarised in Table 5.1. The types are expanded following the table.

Table 5. 1 Types of unknowns in RSM

Type of RSM Unknown	Brief description	Examples from data
1 cues can be matched to frames	Weickian sensemaking where an event occurs which generates information (cues) and the actors match cues to existing frames to create meaning of the event.	Emerging (unknown disease): "So you look at what is this disease behaving like, what does it look like, what can it be. We've ruled, this, this and this out, so that takes you – that's done quickly. So you're not in completely uncharted territory. You're trying to use parallels and your past experience, and your past knowledge, of things." (Dr. Murasami) Incubation period (unknown): "we came to the conclusion that there is very little transmission if you are asymptomatic. But that was obviously a concern, of when to start that person's isolation after exposure. That's part of knowing how the disease is transmitted, what the incubation period is. The incubation period may not be the same as the communicability period. Some infections like influenza you can shed virus before you have full blown symptoms. We didn't know that for SARS." (Dr. Barclay) Multiple unknowns: "We didn't know how it was transmitted, we didn't know what the incubation period was, we didn't know when people were most likely to be infectious with it, so there was a whole list of things we didn't know." (Dr. Borjes)
2 Weick's Cosmology episode (1993)	Cues cannot be matched to any frame – could be due to magnitude of the	In analysis, there was only one situation which suggested a magnitude to be defined

	catastrophic event, or it is so novel it cannot be matched to anything in experience	as a potential a cosmology episode – the Easter weekend cases (see below).

Type 1: Cues are matched to frames

The first type of unknown is the classic Weickian sensemaking perspective (Maitlis & Christianson, 2014), that an event happens, and cues are generated – until those cues can be matched to a frame (or a frame is adapted), they do not have a meaning, they are not "known." The three examples to be discussed here are the agent (the cause of the disease), how the agent is transmitted from person to person, and how long the incubation is in the host before symptoms show.

The cause of SARS

While it was not the task of the OSSAC to discover the cause of SARS, not knowing the causative agent affected their work. Normally, when experts can positively identify the agent, it is matched to a frame which includes protocols that specify what to do. However, with an emerging disease, they did not have any protocols for SARS: "the lab tests were negative. That was probably the biggest thing – is there was no organism identified. As in any respiratory disease you wait on the lab and you do all the tests known to man, but if you come up blank then you are really stymied. It isn't just it isn't behaving normally because there is a lot of atypical influenzas but it wasn't being identified as a known agent" (Dr. Murasami).

Another doctor explained the complete lack of knowledge at the beginning of the crisis: "I remember that conversation – that was my first day – and what is this? We don't know. Was it a bacteria, or a virus? I think we got to virus pretty quick. But we didn't know which virus, we thought it was a strain of influenza. The fact that it was a coronavirus […] A couple

of weeks in I think – holy cow. It's a coronavirus." (Dr. Lampman). Even knowing it was a coronavirus only helped to a point: "there had never been a coronavirus that had caused that serious of an illness before. There wasn't a body of knowledge about coronaviruses that we could turn to, that would be analagous" (Dr. Barclay).

Transmission of the virus

Another unknown was how the disease is transmitted. The biggest concern regarding transmission is case(s) who authorities do not know are carrying the disease: "In hospitals, what I need is to stop transmission. So for me, whether or not somebody actually has SARS, if I'm working in a hospital – not that relevant. It's whether they might have SARS, that matters. …. In any outbreak… the risk to health care workers is from people they don't think have the disease" (Dr. Borjes).

Based on science, there are only a small number of ways transmission can occur. So even though the way the agent is transmitted is unknown, there are only a few ways it can happen, and based on those ways, there are standard protocols for what to do (discussed in RQ1 as "first principles" – the standard infection control measures). Participants report treating the disease as being droplet spread, but over time fearing it might be airborne transmission.

Infectious period

It was also unknown when people are infectious with the disease – do they only transmit the virus when symptomatic? Or more worrying – do they transmit when asymptomatic? This is a very important issue to know, because it affects decision making around quarantine and isolation.

> "You don't know whether people are contagious before they show symptoms or not. That's a really important thing to know because that helps determine whether quarantine is useful or not" (Dr. Murasami).

There are also unknowns that are generated throughout the entire period of the crisis. For example, each time there is a new case, that is an unknown – and people across the system need to find out all the information available to explain the circumstances of how it occurred – for the OSSAC, they need to use that information to revise the directives.

Type 2: Cues are not matched to frames – potential Cosmology episode

Weick coins the "cosmology episode" (1993) concept when actors faced a wildfire with a magnitude and intensity far greater than their expectation, and they could not engage in sensemaking as they had no frames in their experience that could come close to matching those overwhelming, sensebreaking, cues. Not being able engage in RSM, leads to a blockage to the PSM process, which results in actors not knowing what to do.

While each new case of probable or suspect SARS is disheartening, an event that causes a large number of cases is of great concern. I discussed the Easter cases in-depth as an example of RSM to PSM iteration in RQ1. The directives had been implemented for a few weeks, and the Easter weekend they received the news that there were 11 new cases of SARS. This was unexpected because they had designed the directives based on science, as well as their professional experience and expertise. The fact that not only were there new cases, but such a significant number, was shocking. Dr. Grahame explains: "When it was first reported, we were really puzzled, really not knowing what to do," and continues, "fortunately as far as I can remember the only time that we were really stymied." They couldn't explain how it occurred.

In his published reflections on SARS, Dr. Zoutman recalls:

> "That Easter weekend the SARS outbreak seemed to deepen, in a fashion that we labelled "through precautions." In Sunnybrook and Mount Sinai Hospitals, two of the key sites that were handling many SARS patients, precautions were in place. Staff knew about wearing the N95 masks, gowns, and goggles and we had confidence that those precautions worked when they were properly applied. But now staff were showing up sick with SARS despite the use of these precautions; hence, 'through precautions'" (Zoutman, 2006, pg 36).

Ms Shields expands to explain that the observed transmission 'through precautions' caused the OSSAC to perceive their model as "fragile", and "we started to doubt our approach." However, with further investigations, "Soon we learned that the outbreak was not "through precautions." With fatigue and physical stress, caregivers were simply unable to maintain the high level of protection." (Zoutman, 2006, pg 37). During that weekend, they did not have a lot of information, and 'through precautions,' to the magnitude of 11 new cases, and being "stymied" could have been the start of a cosmology episode.

Type 1 and 2 unknowns were in the RSM process, where an event happened that generated cues, and those cues were attempted to match with frames in the meaning creation process. In PSM, the social gaze looks forward into the future to generate possibilities of events that could happen.

There are two types of unknowns in the process of PSM, which is summarised in Table 5.2, and expanded on following the table.

Table 5. 2 Types of unknowns in PSM

Type of PSM Unknown	Brief description	Examples from data
3 Scenarios	Generating multiple possibilities and the actions to take to achieve the desired	"I know there were models brought forward of which, basically it indicated that were going to run out of ventilators. Ontario didn't have enough ventilators

	goal. Unknown if they have thought of all the scenarios that could happen (or prioritised the "right" scenarios to consider), in order to be as prepared as possible.	for the number of patients. We were going to be, and therefore, my impression was they were starting to have discussions about, ok if we have to prioritise – who gets a ventilator, who doesn't. You have to look at that almost like a triage, who's beyond care. So you're into that – awful scenarios to plan for. But you have to look at those sort of things. Again who's on a ventilator, how long are they on a ventilator for. How many people are coming off ventilators" (Dr. McNamara) "Another big worry was the Filipino Bukas-Loob Sa Diyos (BLD) community which had had a SARS death and a large funeral with the usual close contacts and many tears. The potential for exposure to body fluids made us worry that SARS would break out in that community." (Zoutman, 2006, pg 37).
4 Implications of actions	Unknown consequences (what they might be, their magnitude and severity, or even when they might happen) of directives and other advice provided by OSSAC Unknown if directives and measures will be effective to stopping transmission	"So, we knew it was respiratory, we knew what the illness was causing, but we didn't know what the treatment was for it. And we weren't sure that the stuff, the precautionary measures we had in place were going to interrupt transmission. And it turns out we didn't need to have N95s, a regular mask would have been just fine" (Ms Humphries). "When we observed transmission to health care workers, in spite of these measures, this is when we started to doubt our approach and when other more stringent measures were introduced. We weren't really sure if these added measures would work because we quite frankly did not have time to measure their benefits/impact at the time" (Ms Potter).

		"They were the best responses that we had, given what little evidence we had, what experiences we had, what was happening, what seemed to be working, and with a little bit of gut feeling – ok we need to go this way. We need to monitor it and make sure we are not causing more problems than we are solving" (Dr. Goodman). "And did we get it right, did we get it wrong – ok, we felt bad – we didn't take into account some situation, or the unintended consequences of which there were many… the system is so complex and you were under pressure of time. You would normally have sent it out for peer review. Here, send it out to ten hospitals, tell us what you think. So we just sent it out – here you gotta do this. Hey wait a minute, you didn't think of this. We did our best" (Dr. Lampman).

Type 3: Scenarios

Scenarios are presented in more detail in Chapter 4: RQ1 Findings section on PSM. In generating multiple possibilities for the future, during the process of PSM on a large event scale (such as loss of control of the health care system), to more acute PSM (such as what do we do tomorrow), there is uncertainty in exactly which actions will lead to the desired outcome. This is unknown. The scenario at the system level is the fear of the loss of control, that there will be uncontrolled transmission of the disease, and this will overwhelm the system and resources:

> "Basically the fear was that, once it got into the community, and you couldn't trace contacts, when it became endemic - -it was game over at that point. You're looking at completely overwhelming the resources of the health care system. There's no possible way you could have enough ventilators to support what was going to happen. Very, very high stakes and worrisome time…. The assumption that unleashing this into the community where you couldn't trace contacts – that would be the end of the world essentially. And I think we got there almost." (Dr. Townsend)

In the first outbreak, SARS I, they did not know what was possible. There was no precedence, and so, community-wide transmission was a possibility that was considered in scenarios, and thousands of people were quarantined: "It may be argued that we overreacted and created a lot of work for ourselves. With fewer control measures and a more aggressive pathogen, however, the price could have been much higher. We erred on the side of caution" (Zoutman, 2006, pg 38).

Dr. Young explains that in the beginning of the outbreak, with so much unknown, they had to ask themselves what was possible, and generating 'wild' scenarios. "We had to assume that SARS was potentially affecting every hospital in the province, but it just had not shown up yet. And we did not know which hospitals would eventually be targeted. We had to assume that the cases seen that day were merely the tip of an iceberg and that what was visible then had started ten days ago, probably somewhere else. Not only did we reason backwards in time, we had to determine where the disease would appear in the next ten days" (Young, 2006, pg 21-22). The key decision makers had to make difficult calls to limit the health-care system in order to stop potential transmission of SARS. As discussed above, with an emerging disease, they just did not know what was possible – that was an unknown, so they had to act on what they thought was possible.

"Person Under Investigation" or PUI

Cases were identified by the case definition, which included an epi-link – that somehow there was a connection between the person under consideration, and an identified suspect or probable case: "We relied on clinical criteria – if you had the right illness and an epidemiological link, then we were going to call you SARS, you were probable SARS." (Dr. Lampman). A "definite" case of SARS required lab confirmation, and that was not available during the SARS I crisis period.

The fear of the unknown case that could spark off a new outbreak led to a new category in addition to the case definition, the "PUI" – because experts were concerned that the case definition was not catching all potential SARS cases due to the requirement of the epi-link. Dr. Borjes explains that in hospitals, it is the unidentified cases that she worries about: "in any outbreak the risk to health care workers is from people they don't think have the disease" (Dr. Borjes).

As Dr. McNamara explains – missing potential SARS cases by not treating them even though they have symptoms - this could lead to the scenario of the total loss of control, and overwhelming the system:

> "We just wanted them out [regarding the PUI]. We just wanted them under treatment. Because in many cases, you found the link later. But without a link, you couldn't put them in the case definition. And in fact one of the major problems with SARS afterwards is that the whole case definition […] assumed rather that there was no asymptomatic transmission. If there was asymptomatic transmission, the case definition failed. That was one of my major concerns is that was a huge assumption. We had some discussions at the Ontario science committee that this was a major assumption and a major weakness – we could be totally losing control of this outbreak and have no idea" (Dr. McNamara)

All of these cues could potentially lead to the worst-case scenario of uncontrolled transmission and the system being overwhelmed; but because SARS was unprecedented, it was very difficult to predict with certainty what cues were leading to that scenario. This was unknown, and added to the complexity and uncertainty of the crisis period.

> "One of the things that is a liability for us in infection control is "what-if-ing" ourselves into a corner. What if this? What if that? You can frighten yourself by counting how many drops of saliva come out of a speaking mouth; and how many in a cough, or a laugh, and how far do they travel? Eventually you have to stop and settle on the evidence, otherwise paralysis sets in" (Zoutman, 2006, 39).

Type 4: Unknown consequences of actions

In designing and implementing directives, the consequences and implications of those protocols could be projected, but not known for certain. The OSSAC not only had to create directives and provide advice on the way forward in a situation that had never happened before, for questions they had never faced before – they also had to deal with consequences of those implemented directives in real-time, within the crisis period. Early in the SARS crisis, within the first 3-4 days of OSSAC being formed, they designed a directive that included isolating people who had been exposed, not realising that those rules would now apply to their own group:

> "I think I came in the middle of the week and by that weekend we had written a directive on isolating people who had been exposed. And we had agreed to this and distributed, and then realized it also applied to the folks who were part of the committee that we were working with. Many people had been exposed by virtue of being in the hospital, so the net effect was that a lot of the local folks were isolated, and we were very concerned that … would mean that we would not have infrastructure to manage the outbreak. That became an overwhelming concern. …. The bulk of the people in the committee had to be quarantined" (Dr. Lampman)

One participant (Ms. Potter) also reports that in addition to discussing the directives in terms of stopping transmission, they also discussed potential impacts of directives on the health system, and patients who might not get care: "we were worried we were going to kill people by not giving them care" (Dr. Lampman). Sending out the directives (to the POC, who then implemented them in the system), required them to be brave (states Ms. Shields),

because the consequences could be guessed, anticipated to a certain extent – but because this situation was unprecedented the potential outcomes were still largely unknown, compounding the uncertainty.

Unknowns are cues that are not readily matched to frames, they trigger awareness, which leads into the Updating process. Updating is when new cues are incorporated in the sensemaking process to revise provisional sensemaking.

Updating

> "Updating – the process of revising provisional sensemaking to incorporate new cues – is critically important for continuing to make sense of an unexpected event… updating also raises the question of whether the sense that has been made still makes sense" (Christianson, 2019, pg 45-46).

In this section, I will first discuss the new cues that are coming in to the OSSAC – these are both passive (pre-identified sources of information), and active (identified gaps that OSSAC actively seek specific information to fill).

Then, I will discuss revising provisional sensemaking, which is the iterative cycles of sensemaking that occur rapidly and concurrently throughout the long duration crisis. Provisional sensemaking applies in this context, as directives are regularly revised and are "provisional" until the final directives were signed off, and the OSSAC disbanded in mid-May 2003.

Finally, the question of whether the sense that has been made still makes sense is considered in the "a-ha moments" and trajectory changes.

New cues

In this section I will discuss the new information that is received, or sought, by the OSSAC.

Table 5. 3 Passive and Active information flow into the OSSAC

Types of information input	Brief description	Examples from data
Passive	Sources of information that are pre-identified and regularly sent to the OSSAC, such as reports, scheduled teleconferences, scientific journals, and newspapers. (generic information processing)	• Epi Reports from daily morning epidemiologist presentation, and epi document reports [insert examples] • Lab reports • Newspapers (local, national, and international) • WHO reports • WHO teleconference calls • New England Journal of Medicine • Lancet • Hotline into the ministry – calls from hospitals • Morning prioritising meeting between OSSAC chair(s), Jim Young, Allison Stuart
Active	Identifying an information gap, and seeking out specific information to fill that gap in the process of sensemaking (both RSM and PSM)	**RSM** • There are structured pieces of information to find out in order to implement the most appropriate protocols in IPAC • Seeking out if the virus lives on surfaces – transmitted through cleaning staff • Getting feedback from frontlines on directives being implemented **PSM** Getting feedback from other experts/ consultants – such as PPE, pediatricians, obstetrics

Passive Information input

This is the information flowing into the OSSAC that has been pre-identified, and comes in various formats – such as newspapers, scheduled teleconferences, daily epidemiology briefings, or WHO reports (see Table 5.3 above). This information is expected, and is part of the expected flow of information into the OSSAC for processing: "We were getting information on a daily basis, we were tracking WHO reports, tracking the laboratory reports, the public health lab reports, the federal government reports – so there were always reports coming in" (Ms Potter).

Even though the arrival of passive information is expected, often, the contents could be surprising, or unexpected, and could spark off new streams of sensemaking. There was a common hotline where questions would be received and documented, then sent to the OSSAC.

> "we were headquartered in a space where the phone lines were a couple of floors above us. It was in the building. We would get a list of many of the questions and concerns that had come in, from hospitals. In addition, there would be daily [recording unclear…] with all the hospitals in the city as well. And they could all listen in, with any comments or questions, or if there were any updates about the directives" (Ms. Shields).

Additionally, many of the participants report that questions would come in on the hotline that they had not thought of before, or had not anticipated. Dr. Borjes reports: "at some stage one of the pediatricians from Sick Kids called me in high dudgeon because nobody had thought about pediatrics and I said great, so, put yourself together group and write us a guideline on pediatrics ! …. People would call and tell you about things you hadn't thought of."

One of the daily information inputs would be the morning epidemiology report, where a key epidemiologist would visit the OSSAC and present the update. Dr Lampman explains: "That took quite a while to get that information, but once we had it, it really was critical. So it helped shape the purpose and content of the directive."

Active information seeking

In active information seeking, the OSSAC has identified a gap in information and are initiating data collection for that specific gap. This occurs in both RSM and PSM. There are several examples below.

Getting feedback from frontlines (RSM about implemented directives)

Getting feedback from the frontlines is an integral part of the sensemaking process of developing directives. In order to get feedback they had to establish lines of communication with field sites (hospitals). As Ms. Humphries explains, this is very important because the OSSAC are "distant from the emergency" where the directives are being implemented: "every time that you send out something or a guidance, that you touch base with the field in a really meaningful way. So that you gather information from the field to say what's working, what's not working, and how can we change it, and get that information back to the committee on a regular basis" (Ms Humphries).

Investigating the unexpected (RSM)

Gathering evidence to explain the puzzle of the unexpected is key to RSM. One of the issues the OSSAC discussed was transmission, and how it can occur. In RSM, in the interpretation phase of meaning creation, the team works together to create possibilities to explain cues – such as continuing to see transmission among HCWs even after directives were implemented:

> "we had a conversation around how much the environment played a role in transmission, and whether or not we had to change – how could we get the burden of, in this case, virus, the bio burden down in a room. And we looked at cleaning protocols and what they should be cleaning with. And whether or not we needed to change that. So that played a lot into revisions as well." (Ms Shields).

To see if their provisional sensemaking is correct, they had to gather information:

> "I remember … there was some question at one point, did it build up on surfaces and did you reach a critical level and they were having discussions on environmental cleaning … well, we were seeing transmission in the hospitals… [was there] any data to say whether it was from a person-to-person vs could they get it off surfaces. Of which, did we have any cleaners coming down with it, what was the nurses, health care workers, and we were looking at what about people in their homes, how was it being transmitted in their homes." (Dr. McNamara)

In this example, the OSSAC engaged in RSM, identified a provisional explanation for the cues, then took action to gather information to confirm that possibility.

Another example of active information seeking in the RSM process is when the CDC was invited to do an investigation, and to see if the transmission was airborne: "They were trying to take air samples and trying to come up with – is this airborne. The transmission was bizarre" (Dr. Lampman). Ms. Shields observes that the knowledge transferred from the CDC was "powerful" as at that point in 2003, there had not been rigorous IPAC research in Canada. They discovered that the spray from patients could go much further than they initially thought.

Input from expert consultants (PSM)

> "if it was very specialized, that group would consult with pediatricians, or obstetricians or specialists. We were sitting in downtown Toronto so we had access to any expertise we wanted, to say, what do you think, what would be the way to manage this? We had other infectious disease experts who were still in their hospitals managing the outbreak. They were the source of knowledge about what was really happening. And we would ask them, what do you think? Will this work? That's how we came up with our best efforts to come up with a plan for people to manage these situations" (Dr. Lampman).

This is seen in the Easter cases example in RQ1 – with the 11 new HCWs cases, they increased the level of PPE, and consulted with experts in various types of protective equipment to gain deeper understanding of the options.

Long duration sensemaking: iterations of revising provisional sensemaking

> "So if we sent out a directive, and if something bad happened in the hospital, we would have to quickly try and debrief the hospital, find out what went wrong and then plow that into the next iteration of the directive, which might have been delayed by – or not been delayed – but there might have been a spacing of a week or 10 days, between those two versions – version 1, version 2, version 3. And we would also try to apply it to the next directives we were making to other groups." (Dr. Pearce)

In the RQ1 findings chapter, I presented the iterations of sensemaking, in a clean linear reductionist form; in RQ2, we see that the 'real-time' work of the OSSAC is not linear, there are multiple concurrent streams of sensemaking. The building of the SARS frame (and codifying knowledge) is not linear; it is cumulative. Dr. Setterfeld describes it as:

> "going with the cumulative information that you've gotten, and sometimes it's gut feelings. Particularly with a brand new disease. When we deal with stuff like influenza, we have a lot of back information that tells us what we should do even if this strain may be different. But with something that is brand new, you just have to go on a lot of times what your gut feeling is about what its going to be. Each case that happens, there's a lot of dissection about what happened, and you learned from each case. Cumulative experience – I guess that would be the way I would put it."

This "cumulative experience" is built through learning through each version of directives, when they were implemented in hospitals: "these various iterations – a lot of it was looking at what's working, what's not working. What seems to be working. What is logistically feasible" (Dr. Pearce).

A continuum of revisions

Ms. Shields explains that each new version of a directive could be due to small changes, such as a minor update, to major changes such as significant updates:

> "Sometimes that drove hospitals crazy. As you can well imagine, they might have got directives just the day before, started implementing it, and then a fax would come with a new revision. And sometimes that was based on updates that we would get from all the hospitals involved, and any new cases, new onset of symptoms. So some of the changes might be around new hospitals that were closed, how we would redirect patients, so sometimes it was that. Sometimes it was literally new facts had come in, and so that would change the directive" (Ms Shields).

Iterations and revisions do not necessitate trajectory change; however, some new cues do lead to a trajectory change.

The question of whether the sense that has been made still makes sense

For the OSSAC, a trajectory change was when their focus (bracketing) altered direction – and that is due to new information coming in that, when interpreted, caused a change in focus: "That's a key issue, how do you change directions. And if you don't flag from the start that you might be changing directions as you learn more information then it becomes really hard to do" (Dr. Murasami).

When the OSSAC reach a particular realisation, a particularly meaningful understanding of information (as interpreted by the OSSAC), an "a-ha moment" – this may lead to a trajectory change (Table 5.4).

Table 5. 4 "A-ha moments"

Interview data	Significance
"And it had very peculiar behavior. It seemed to transmit in the healthcare setting far more than it did in the community, which – we had to learn that. We didn't know that. With the BLD community exposure we thought we were going to be in big trouble. In the community. Didn't happen. Then the lights went on, and we were all sitting there saying – this is not a community influenza virus. It was hugely different, and that was a big a-ha moment. […]It had very significant implications. Because, if influenza spreads in the **c**ommunity, in schools for example, shopping centres, public gatherings – this did not, and which means we could apply criteria and apply techniques that were pretty well established in health care. Isolating people – contact, droplet precautions, airborne particle what have you, screening. It would be much easier to do that in a hospital than it would be to do that anywhere else**."** (Dr. Lampman)	This 'a-ha moment' resulted in a trajectory change that affected bracketing – they were able to focus more on facilities rather than community – a more precise focus of resources.
"And it was a one-off scenario that drove a whole bunch of changes into how PPE happened. It really shouldn't have, if we had all that information about what happened in those scenarios that were different. What was different about that, and why was there transmission happening, whereas when we were recommending to gown and glove – putting it on and taking it off – what was different about all of the rest of the people doing this and not getting SARS?" (Ms Humphries)	Ms. Humphries is referring to the significant number of new cases over the Easter weekend. That new information caused a trajectory change in an increase in stringency in measures, including PPE, and a concern that the virus might be airborne.

"We had to go through that journey. It wasn't until we realized that we had information to say – the BLD community had their funerals and things going on – we thought – this is going to be a big deal, we're going to see a lot of transmission, but it didn't happen. We were – with transmission – we don't have all the answers even to this day but it was – transmission was for the most part was in the health care environment, not in the community. Almost exclusively so." (Dr. Lampman)	In early April, there was the BLD community – a large Filipino religious group – that had several hundred people who were in contact during a funeral. The OSSAC feared that SARS would be similar to an influenza transmission, but with incoming information, they found there was no community transmission from the BLD scare. This "a-ha moment" was part of the process of changing focus back to acute care.

In passive and active information seeking there is a high volume of information entering and being processed by the OSSAC; bracketing is an integral function for sensemaking, in order to sift and focus on the information, or issue, that is most relevant for their goals.

Bracketing

As presented in the literature review, bracketing is a focus of group attention, a boundary on the multitude of cues and the possibilities of frames: "sensemaking is grounded on the ability to bound the continuous flow of human experience – the ability to put some boundaries around a portion of the flow into which one has been thrown when engaging in an activity or project" (Sandberg & Tsoukas, 2015, p. S9). Collectively, bracketing is "attention coherence" – where individuals are jointly focusing attention to a particular issue.

Bracketing was the process of evolving attention and sensemaking activities on the most important (as defined by the OSSAC), or high value, issues.

Evolving focus to more "high value" issues

Dr. Lampman explains that epidemiology helps the scientists hone their focus – for example, in the beginning they knew nothing about SARS, what the cause was or how it was transmitted, so to be very cautious, the POC quarantined an entire building. Dr Lampman explains that "it's a wide net, and it's harmful. You're trying to prevent harm, but on the other hand you're actually causing it – well, we didn't prevent anything, so it was all harm in the end, not malicious, but it was all harmful. Or at the very least unnecessary."

As the crisis progressed, and the OSSAC gathered more information and gained more knowledge about the disease, they were able to adapt and evolve their focus to more "high value" targets. For example, they focused less on writing directives to the broad community environment, and more on acute care, once they realised that SARS was not spreading in the community, but rather in hospitals. Choosing the "high value" targets to focus on was based on the practical: "They would come to us – what are we going to do in the emergency department screening, what are we going to do in the operating room, and then we wrote directives in answer to those scenarios that people had seen. Or that we felt were significant enough to warrant us writing a directive. We couldn't write a directive for every 'what if' because that's not possible" (Dr. Lampman).

Bracketing occurs in both RSM and PSM (see the sensemaking sequence in Chapter 4: RQ1 findings); PSM bracketing encompasses RSM, because it is in RSM that cues from events that have occurred are interpreted. It is in RSM that the "a-ha moments" of realization occur, which then lead to trajectory changes, and hone the focus of both RSM investigations, and PSM scenarios.

The scenario they were bracketing would be in PSM – imagining a future, and imagining all the steps they would go through to limit transmission of the virus in all of the detailed work they would do in a hospital.

As discussed in the findings for RQ1, there are cycles of RSM to PSM which develops the directive in one cycle (resulting in sending the product to the POC); when implemented, they are given feedback from the field about what works, what doesn't. This feedback is then brought back to the RSM cycle for processing. And another cycle of RSM to PSM is entered in developing the next iteration/revision of the directive.

It is in the information that is fed into the RSM process in the iterative cycle, that shapes the trajectory of the OSSAC – that shapes their bracketing over time: "the committee used the epidemiological data to help frame their directives in terms of the context. They also used it to recognize where the outbreak was going and thus where new directives were needed or updated" (Dr. McNamara).

As discussed earlier in this Updating section, new cues can result in interpretation that leads to a change in trajectory – such as an example of cues that lead to the OSSAC focusing away from the community, and more on facilities and acute care.

> "… and then we saw the super-shedders as we called them – people who were very sick who during procedures that generate aerosol like during intubation or what have you in the ICU were spreading it to other health care workers.
>
> All of that information, plus the information from Hong Kong, allowed us to start focusing our attention on things that were high value. Isolating a school or an apartment building or something like that was not going to be of any value….
>
> …isolating the whole community, limiting movement. That becomes very very difficult. People were scared enough, as it was. To add to that would have been for no value and cause a lot of injury, and harm." (Dr. Lampman)

Bracketing is the evolving process of honing social attention in Updating. Satisficing is the process of Updating which takes in the new information, and then as a team they provide advice on the way forward (PSM).

Satisficing

"you had to balance providing care, which is the first priority, with the challenge of doing so without spreading this disease. Sometimes those are incompatible objectives. We tried to make them as compatible as possible but it wasn't easy." (Dr. Lampman)

As stated in the literature review chapter, satisficing is a term coined by Herbert Simon and is a combination of "satisfactory" and "sufficient" – basically, a solution that is "good enough." (Simon, 1956). In an urgent crisis situation, it is important to take action as quickly as possible, once there is just enough information to move forward with the task at hand (K. E. Weick, 1995).

Data suggest there are three polarities influencing the advice of the OSSAC; and that balancing the tension between these three in writing and revising directives is the act of satisficing.

- Science
- Sociopolitical
- Practical

Science

The OSSAC is comprised of experts, both academic and clinical, who are tasked to provide advice to KDMs. This is challenging when facing an emerging disease with no existing research literature, and evidence is being gathered in real-time.

They drew on "first principles" (see RQ1 findings chapter, Table 4.2), as well as analogous respiratory diseases as templates to start building the directives.

They faced so much unknowns in the beginning – not knowing the range of symptoms, incubation period, no reliable diagnostic test, no vaccine, and no treatment (Young, 2006).

> "When we asked ourselves: "What *do* we have?" we turned to history. What would our predecessors have done one hundred years ago? They would have implemented strict infection control, including aggressive quarantine or isolation. Those were the only two things that were readily and logically available, and those were the things that we used. Did we know the characteristics of SARS and that it might be stoppable? No, we did not. And the worst of it was that we had to wait for 10 to 14 days to learn how the new disease would behave" (Young 2006, pg 21).

As Dr. Young explained, with so many unknowns, they turned to what has worked in the past: quarantine and isolation in terms of implementing public health measures.

Through many years of research on influenza, there are models from that disease that can be borrowed for SARS, as there is no precedence. Based on the assumption of influenza, a big gathering would have been a problem, according to Dr. Lampman, and that caused them a great deal of concern when they were projecting possible scenarios if people were exposed at the funeral. Dr. Lampman reports that "based on an assumption of influenza – a big funeral, a lot of people, lots of gatherings – that would definitely be a problem."

Another area they borrowed from, that already had been developed in steady-state rather than crisis times, was the Health Canada guidelines in developing the directive for acute care, and the British Columbia pandemic plan (another province in Canada). Dr. Lampman explains that: "Because that's what we had, and we used that as the basis for the kinds of principles we would apply. Because they were tried and true, they weren't up for a lot of debate. And so, hand hygiene, droplet, contact precautions – you had something to relate to so you weren't starting otherwise you were reinventing the wheel literally. We weren't up for that – we didn't have time for that" (Dr. Lampman).

The experts serving on OSSAC were scientists, experts in their field – trained to use the best evidence in their decision making:

> "In medicine, doctors are trained to "make informed decisions based on evidence-based science. There's a hierarchy of five characteristics or confidence levels that you try to have in place in order to make an informed decision; for complete confidence, you want to have all five before you act. With SARS, we were barely at level one, but that was all we had, so it was our best. And on that we based our decisions" (Young, 2006, pg 22).

Science is the foundation on which the OSSAC experts function in their professional capacity, and they were called to serve in a situation where there was very little evidence to formulate science-based decisions with confidence.

Sociopolitical

The sociopolitical polarity is comprised of social issues such as managing fears, and anxieties of the HCWs, and political issues, such as governance. This was a balance, because sometimes the POC would implement a directive, but the HCWs may have perceived the decision(s) to hamper their ability to do their job, and pushed back against the directive:

> "I know the screening of health care workers was a big one that there was a lot of push back. We felt really, that we needed to do that. So any of the facilities where there were cases, we required all the health care workers to have their temperature taken and to screen for symptoms every day when they came to work. And in those facilities there was cancellations of certain types of services, so yeah, it was challenging." (Dr. Goodman)

Another source of pressure was from the HCWs and their unions, to be kept safe. This is very understandable, as HCWs are facing an unknown threat, that posed an unknown risk, but potentially could cause them to be very ill, or even die.

Dr. Carnegie explains from her perspective as a HCW, caring for patients ill with an emerging disease:

> "you're scared witless. So it wasn't only a matter of could you effectively prevent transmission with a mask – a health care worker, any body in their right mind wouldn't go in unless they felt safe. So we weren't sure, but it was – keep our workers safe. And have them psychologically able to go in, and look after the patient. If you provided a level of protection that was substandard, or perceived as substandard, you wouldn't get anybody going in to work. And so some of the stuff that was done, was actually overkill."

In the early part of the crisis, with members of the OSSAC being quarantined due to exposure to the virus, there was concern there would be "nobody left to do the work" - and this fear cuts across the system, because if nurses and other staff are too afraid or do not feel protected from the threat, and do not come to work, then no one would care for the patients.

Practical

What is feasible and do-able in practise, in the real-world, with available resources (human, system, financial). The OSSAC are a group of scientists (their backgrounds included: infectious diseases, IPAC, medical microbiology, and public health) and some are clinicians who directly care for patients. Clinicians, and other experts with first-hand experience of hospital sites can provide advice based on their experience, but that is not the same as seeing the directive implemented in real-time. The boardroom where the directives are developed and revised is far removed from the field. As Ms. Humphries explains, "sometimes the things that sound good in a meeting room, when you try to implement them in real life, in the field, are not manageable, and created incredible challenges for people on the front-line."

For example, in one of the first directives, it stated that an IPAC professional had to be on call 24/7 and that he/she would have to triage every patient transfer: "For the four hospitals

we have the birthing centre, trauma centre, neuro centre, cardiac, centre – that's a lot of calls. So we had to figure out another way to do it because I remember going 36 hours with not a whole lot of sleep. Getting woken up every hour on the hour" (Ms. Humphries).

The practical aspect is not just about logistics and flow, but also about clinical practise. Dr. Carnegie provides a clinical example of practical input in directive development:

> "one of the things we came up with to limit spread was, because it was a big concern, with people coming in with a cough, and fever, and potentially having SARS, and then infecting everybody. Well one of the proposed ways of trying to prevent this was putting masks on all these patients. But if you've read some of the historical stuff, some of the patients were horrendously sick and couldn't breathe. So can you imagine a patient came in sick and you put a mask on them, you basically would make them worse. So you couldn't apply this rule to everybody, you could only apply it to people who were actually well enough to have that and so, I was listening to this and thinking – you gotta be joking you're going to kill the patient, or at least make them worse off! So I piped up and said hey, excuse me but that's not practical, because of this and this."

Balancing the poles

There is not enough data, or the type of data, to show how the poles are balanced – this would likely be best observed through ethnography, which will be suggested for a future study in the Conclusions chapter. However, the data does show that the three poles can be antagonistic, and it can be difficult to balance the three – they are not equal in weight. The data suggests that the highest priority weight is what is practical, followed by sociopolitical factors, with the least weight (and likely because there is no existing knowledge on SARS at the time of the outbreak) being science.

First, I will discuss what the data does show about balancing the poles, then I will discuss the relative prioritising of the poles.

An example in balancing the three poles is the OSSAC having the expertise to know:

> "accumulated understanding of the spread of the infectious diseases and infectious agents – there's only a limited number of ways they can be spread. And so you can use that to our advantage – say ok, we think, based on what we know, this is going to be droplet and contact transmission. We got into a very convoluted somewhat unproductive argument over whether it was airborne or not. And because there were facets of it that were long distance transmission – so we used the paradigm of droplet and contact and then we went to the possibility of airborne transmission, and that brought in the whole N95 respirator challenge, which was a huge challenge." (Dr. Lampman)

Dr. Lampman explains that the experts worked together to with their knowledge of science to make some initial assumptions – the first pole is science. The experts engaged in RSM and debated the type of transmission they thought it may be. This is balanced with sociopolitical issues – "when you are dealing with health care workers who were literally afraid to come to work, and what we were doing wasn't 100% effective. We've had N95 respirators to be honest because this virus is rather unforgiving, and where there were slip ups, there was transmission" (Dr. Lampman).

Ms Potter observed that "it wasn't just necessarily making a decision based on science. It was – based on our best knowledge, this is the best practice, what are the implications to the system in putting this in place, and is there anything we can do to mitigate. Not as succinct as I've just described it. It was much more amorphous than that."

Dr. Carnegie also explains that even when the science suggests they do not need a higher level of protection, they do it anyway. Dr. Carnegie states: "it is a big responsibility. You had to go the higher level because you didn't want to put people at risk. Because, here they are doing this job that is really difficult and would you want to risk somebody getting sick because you were wrong." The data supports that the sociopolitical polarity is stronger than science.

The data also suggest that what is practical is weighted more heavily than sociopolitical or science factors. Due to the HCWs fear of transmission, a high level of protection would be PAPRs – or powered air purifying respirators. But, these machines are "very, very unpractical" because "the more layers of protective equipment you force people to wear, the more difficult it is to apply it in the fairly uncontrolled setting of the hospital emergency

department or the ICU. So that's why we avoided – we practically debated that endlessly. Just decided that we weren't going to go there" (Dr. Lampman). As presented in the RQ1 findings Easter example of iterative sensemaking (Table 4.4), the possibility of Stryker suits was also debated – it was unlikely, even if the directive was implemented, that there would be enough Stryker suits for each HCW treating a patient, and available immediately.

Overall, the findings suggest that in the situation of an emerging disease, with the urgency to take action as quickly as possible, to limit transmission and regain control in the face of the unknown, that the most important factor in deciding what to do (in designing and revising directives) is what is practical, followed by sociopolitical factors, and finally, science (Figure 5.2). As Ms. Shields explains: "In the end, it was very practical – what do the hospitals have – what equipment do they have that might be equivalent to a PAPR… because it needs to be implemented immediately" (Ms. Shields).

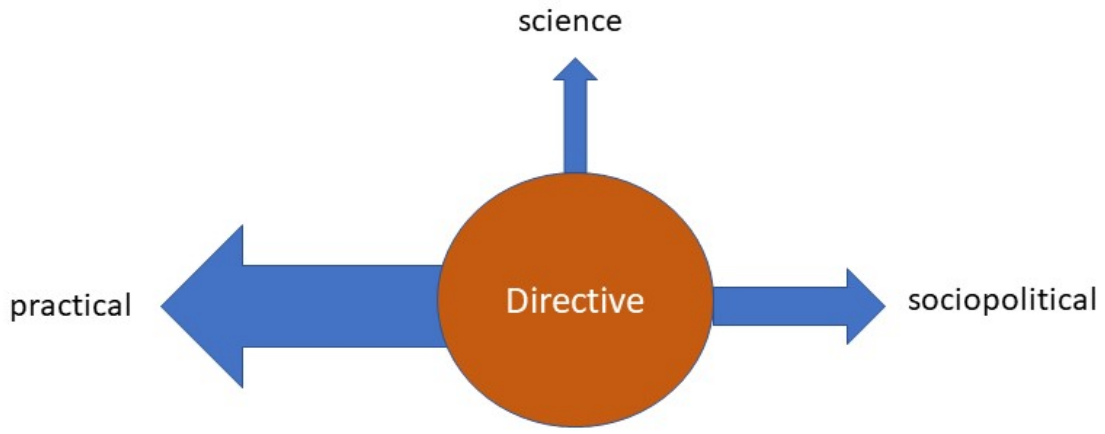


Figure 5. 2 Satisficing: the relative polarities of science, sociopolitical factors, and practical concerns

The purpose of sensemaking is to create sense, to create meaning out of a mass of cues. For the OSSAC, this meaning is codified knowledge, in the form of directives.

Codified knowledge

Internationally, experts are collecting as much information about SARS as possible – the genome was sequenced, PCR tests were done, analysis of symptoms, incubation period, and also its evolution within that time period.

This was also done internationally through abductive means, because there was no other choice – the threat of the disease spreading forced governments to take action as quickly as possible, often with fractional knowledge. As SARS was an emerging disease, it was a time of discovery: they were learning about the disease, and codifying knowledge about SARS. At the same time, they were formulating provisional protocols and implementing with the knowledge that they would need to be revised; so, abductively, they would formulate a provisional directive (in PSM), then implement it, then analyse feedback (RSM), and revise (RSM/ PSM) and carry out the cycle again. This was done until, in the specific case of the OSSAC, they achieved directives that worked, and HCWs were able to take care of patients without transmission.

The final directive created in the SARS I process was signed off, and the "new normal" implemented in the health system by May 16, 2003 (See Appendix 5.1 for the transition letter).

When SARS II began, they had the benefit of having just been through an outbreak of the SARS virus. They had a finalised set of directives for SARS management across several contexts (not only acute care settings). During SARS II: "we did not have to shut down the hospital system, because everyone already had gowns and masks and knew what to do. We just had to tell people to reinstate the methods that they had used before. … things had changed greatly by the time of the second wave; we knew exactly what was needed to stop it." (Young, 2006, pg 24).

A key leader in SARS governance said: "well we know what to do, we just have to do it all over again. She said it will be fine, just do it all over again. […] It's just slogging at that point" (Dr. Murasami). They just need to follow the knowledge they have already codified in the final directives created in SARS I.

In this chapter, I presented the findings for RQ2, the conceptual framework of information dynamics in long duration crisis sensemaking. The OSSAC learn with the input of new information and change trajectory throughout the course of the crisis period to focus successively on more 'high value' targets, with the goal of stopping SARS transmission. In the next chapter I will provide a 'big picture' of the overall RQ1 and RQ2 findings and discuss implications.

Chapter 6: Discussion

Chapter overview

This chapter is organised into five sections. First, this research study began with a conceptual framework of long duration crisis sensemaking in the Literature Review chapter. I will discuss the findings for RQ1 and compare them to what was expected.

Second, I look at the big picture of RQ1 and RQ2, and how the OSSAC sensemaking fits within the greater health system. I posit that the OSSAC sensemaking is regulated by the balance of knowns and unknowns in the greater health system. Furthermore, the knowledge generated by the OSSAC has an impact; the level of this impact is discussed, and situated amongst research on individual, organisational, and grand narrative levels of learning and knowledge.

Third, the OSSAC were codifying knowledge at the edge of the unknown. They were learning, and then implementing those learnings into a new revision of a directive. I draw a parallel between the OSSAC sensemaking to design thinking and design process. This is seen through their work in generating scenarios, writing directives, and then analysing feedback from the implementation of directives to revise into the next iteration.

Fourth, the sensemaking of the OSSAC is a function of the individuals serving on the committee, and what frames they bring. The social library of frames is critical to the efficacy of sensemaking, and involves creativity and imagination, in linking cues to frames in RSM, and adapting frames in PSM.

Fifth, as the frames that are available for sensemaking are critical for efficacy, and there is the need to act as quickly as possible in a crisis – it is important for EAGs to have a wide library of frames, as well as be able to engage in abductive thinking (design thinking). They need to be able to implement provisional solutions, that are amenable to change, regularly, throughout the crisis period. Limitations, generalisability, and recommendations for future research are also discussed.

SECTION 1: How research findings differ from what was expected

Literature review conceptual framework

In the process of conducting the literature review for this study, I found that there was no previous research on long duration crisis sensemaking, particularly during crisis response. I followed an abductive grounded strategy: Weick explains abduction as the ability to "generate plausible conjectures about the meaning of fragmentary evidence" (K E Weick, 2010). Thus, while there were no other studies on this particular process, I adapted concepts from the closest topics – Weickian sensemaking of acute crisis sensemaking. Furthermore, Weick has also stated that crisis and everyday sensemaking patterns are not that different: "The sequences are similar but the intensities are different" (Weick, 2010).

I synthesized a provisional social sensemaking conceptual framework based on Weickian sensemaking concepts in acute crisis sensemaking. I also integrated Weickian sensemaking with Schön's reflective practitioner concepts for reflecting-on-action (retrospective) and reflecting-in-action (prospective). This is because the literature did not hold a conceptual framework that integrated retrospective (making sense of an unexpected event that has happened) and prospective (generating possibilities of the future) sensemaking.

This resulted in a provisional conceptual framework (Figure 6.1) that is compared to the research findings.

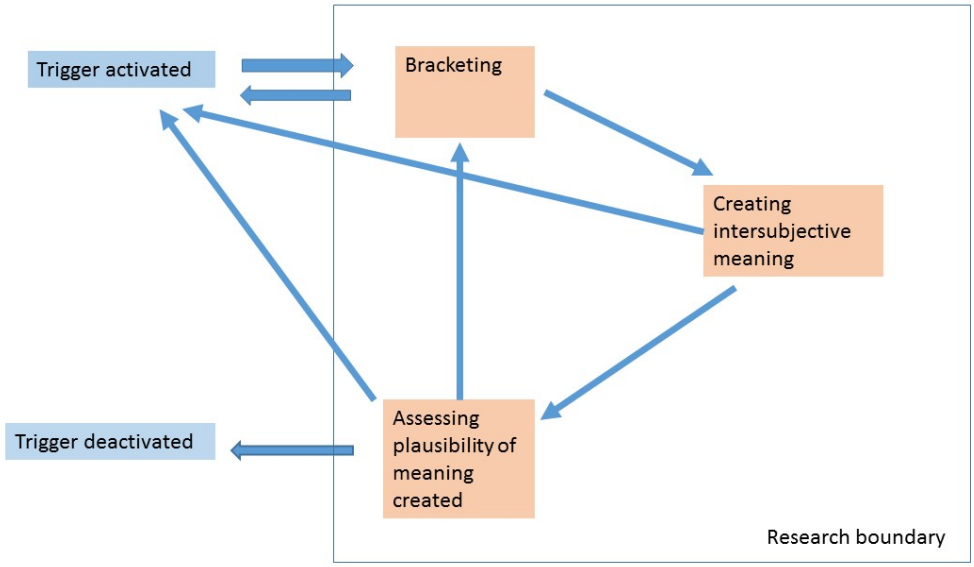


Figure 6. 1 Conceptual framework synthesized from literature review

Here, I synthesized the social sensemaking literature, including two comprehensive literature reviews on social sensemaking, to depict the key concepts in the Weickian sensemaking process. Also, in the beginning, I made an assumption that the Weickian sensemaking conceptual framework would represent sensemaking at the crisis event level – hence I did not include the trigger for the SARS crisis, or the ending of the crisis period, as those decisions lie outside of the OSSAC, the team being studied.

Through the process of iterative data collection and analysis, the social sensemaking process became clearer. Rather than the Weickian sensemaking conceptual framework representing the SARS event level, the view shifted to the generalised sensemaking process at a directive level (the sensemaking process in creating and revising one generalised directive). That is discussed in the RQ1 findings (chapter 4). In the RQ2 findings (chapter 5), I 'zoom out' to look at the information dynamics involved in multiple and concurrent streams of sensemaking over the crisis period. The overall crisis event sensemaking does not follow the linear path I had first assumed in conducting the literature review. This will be discussed further in section 2 of this Discussion chapter; next, I will compare the initial conceptual framework from the literature, and the findings from data analysis.

Integrating Weickian RSM with PSM through Schön

One of the key contributions anticipated from writing the literature review was the integration of Schön's reflective practitioner concepts of "reflection-in-action" and "reflection-on-action" with the Weickian sensemaking conceptual framework (Figure 6.2) to distinguish between retrospective and prospective sensemaking in advisory work.

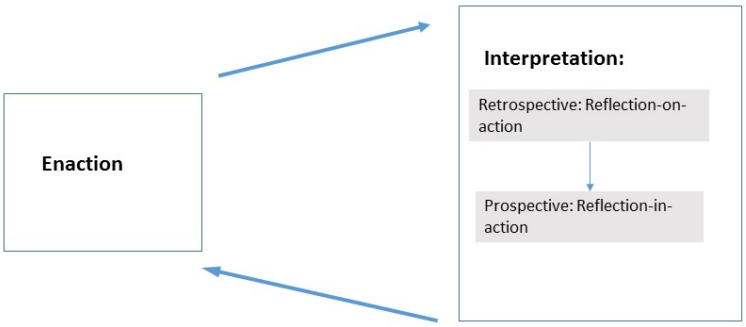


Figure 6. 2 Weickian meaning creation integrated with Schön's reflective practitioner principles

In the literature review, I noted that Weick had been criticized for not adequately representing anticipation, which expert practitioners are able to do with more experience and ability to project from current cues (Whiteman & Cooper, 2011). Schön, in contrast, conceptualises prospective thinking. He is known for his work on the reflective practitioner and how actors engage in the messy, murky world of problem solving, often with a "knowing-in-action." For example: an actor notes a problem and generates scenarios about how to solve it (with a tacit 'knowing' of potential ways to solve it, due to his experience). He then enacts a solution, and reflects on the experience including the outcome, to learn from it, but often cannot explicitly verbalise this knowledge. It is from experiential (tacit) knowledge held within the practitioner (Schön, 1995). The 'knowing' of potential ways to solve the problem and reflecting-in-action to consider scenarios of solutions, is prospective sensemaking (but from within an individual, rather than social sensemaking).

This integration of Schön into the Weickian sensemaking conceptual framework was an abductive leap: yet, not a wild leap - researchers have discussed the close pairing of Weick and Schön before, in exploring sensemaking, practise, and experience (Orlikowski, 2002; Whiteman & Cooper, 2011). However, I had not found explicit research on the alignment of retrospective and prospective sensemaking with Schön's concepts of reflective practise before.

In reviewing my literature review, and my thinking process – I see now that I was conflating social sensemaking and cognitive sensemaking. Schön's reflective practise is describing a single practitioner's transition from considering multiple possibilities, scenarios, in their head, choosing the optimal path, and then implementing it. After the action, the practitioner replays what happened, and considers if the action unfolded as they had imagined it would. Schön (1995) provides an example: a basketball player imagines a play, chooses the optimal one, and carries it out on the court. After the game, he then replays it in his mind to see if it went according to the scenario he imagined, and considers explanations as to why. He learns from the experience. It is a direct 1-to-1 process of prospective and retrospective sensemaking.

Subsequently, in the conceptual framework, I depicted the relationship between retrospective and prospective as one linear process, within an Enaction and Interpretation cycle (figure 6.2). I thought that once Enaction is carried out, then the practitioner would learn from what happened, transition to planning the future, and then carry out further Enaction.

However, in the findings of the research, retrospective and prospective are not linearly related. The complexity, chaos, and urgency of the crisis event, in addition to social complexity (Conklin, 2006), all affect the sensemaking process. This is not accounted for in the provisional literature review conceptual framework because, as discussed above, I had conflated social and personal (cognitive sensemaking). Additionally, the provisional literature review conceptual framework represented a different level of analysis: I had assumed it would represent the crisis event level when writing the literature review,

however, once I began data collection and analysis, the conceptual framework became a representation of one generalised stream of sensemaking (of one directive), not of the entire crisis event.

The findings show that RSM and PSM are separate processes in social sensemaking – not tightly coupled within Interpretation and belonging to the same sensemaking cycle that I had first thought when conducting the literature review. RSM and PSM have separate meaning creation cycles, and cycle in opposing directions, as presented in Chapter 4, the findings for RQ1 (Figure 6.3). The driver for the meaning creation cycle is in Enaction for RSM (action generates cues, which are then processed in Interpretation). For PSM, scenarios are generated in Interpretation, and then Enaction is taken to seek further information to substantiate potential pathways, in order to write/ revise the directive.

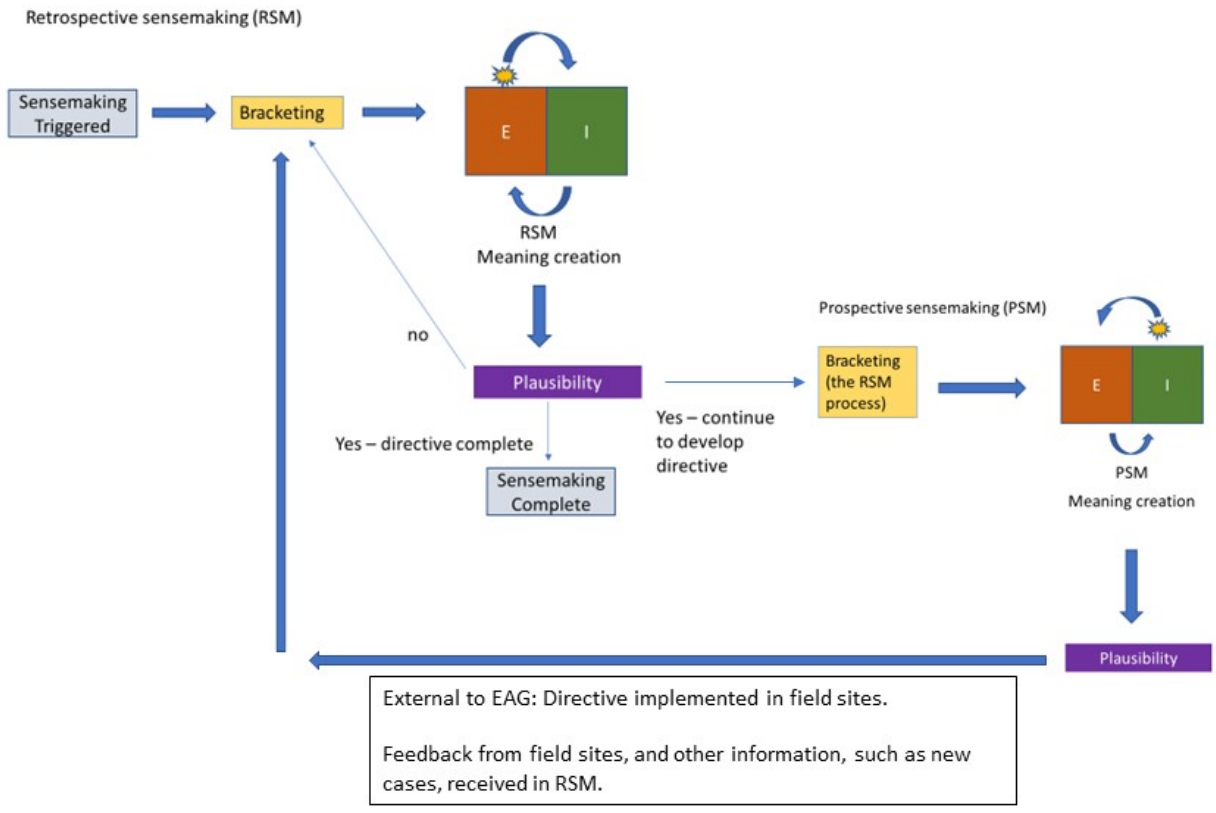


Figure 6. 3 Conceptual framework of EAGs social sensemaking through a long duration crisis response

RSM and PSM are interrelated, not tightly coordinated

In the findings for RQ1, the conceptual framework shows a generalised sensemaking stream for one directive, from creation to multiple revisions (figure 6.3). RSM and PSM are interrelated but are not tightly coordinated processes, similar to the example of the team coordination on flight decks (K E Weick & Roberts, 1993). RSM can occur independently of PSM, such as discussing feedback from HCWs, but this may not necessarily warrant a revision, or, a revision may not warrant PSM and generating scenarios. In contrast, PSM is tethered to RSM; a need is identified in RSM for creating a directive, or revising one, and then team attention moves into the PSM process.

Furthermore, RSM and PSM are not 1-to-1 processes in a sensemaking stream for one directive. It is not imperative for each cycle of RSM to lead to a PSM cycle, or four cycles of RSM to demand an equal number of PSM cycles. The number of cycles in each sensemaking process is independent of each other.

As stated, this is a generalised linear conceptual framework, but the real-time process of sensemaking is very different. There are multiple concurrent streams of sensemaking, as there are multiple directives written, reviewed, or revised throughout the day. Directives work is also split into different teams; in any one day there could be several directives in varying stages of revision being reviewed at the same time, by different teams.

It is important to note that the conceptual framework (figure 6.3) represents the generalised process for **one stream of sensemaking** – one directive.

Key contributions of RQ1 findings

- Development of the conceptual framework of long duration crisis social sensemaking, specifically: experts' social sensemaking to create and revise protocols during a long duration emerging disease crisis response;
- Development of insights into the RSM and PSM processes, specifically:
    - Meaning creation is driven in opposite directions in RSM vs PSM; and
    - RSM and PSM are interrelated but not tightly coordinated

SECTION 2: OSSAC as an open system, learning through crisis and relation to design

OSSAC as an open system

Earlier in this chapter, Figure 6.3 reprints the conceptual framework from the RQ1 findings, representing the generalised linear sensemaking process for one directive, from creation to revisions, and finalisation. While the RQ1 findings focused on following the process for one directive, in real-time, the OSSAC may be working on multiple directives in a day.

These multiple concurrent sensemaking streams are seen in figure 6.4, the reprinted RQ2 findings conceptual framework. In the centre Updating panel, the cycles of sensemaking are varying heights and widths, with varying magnitudes of intensity and time. The overlaps represent the multiple concurrent aspect of sensemaking, that occur throughout the entire SARS crisis response duration. A high volume of cues enter the OSSAC to be processed, and through all the cycles of sensemaking, knowledge is codified, and one of the results is the clear circle at the end of the crisis: the finalised directives.

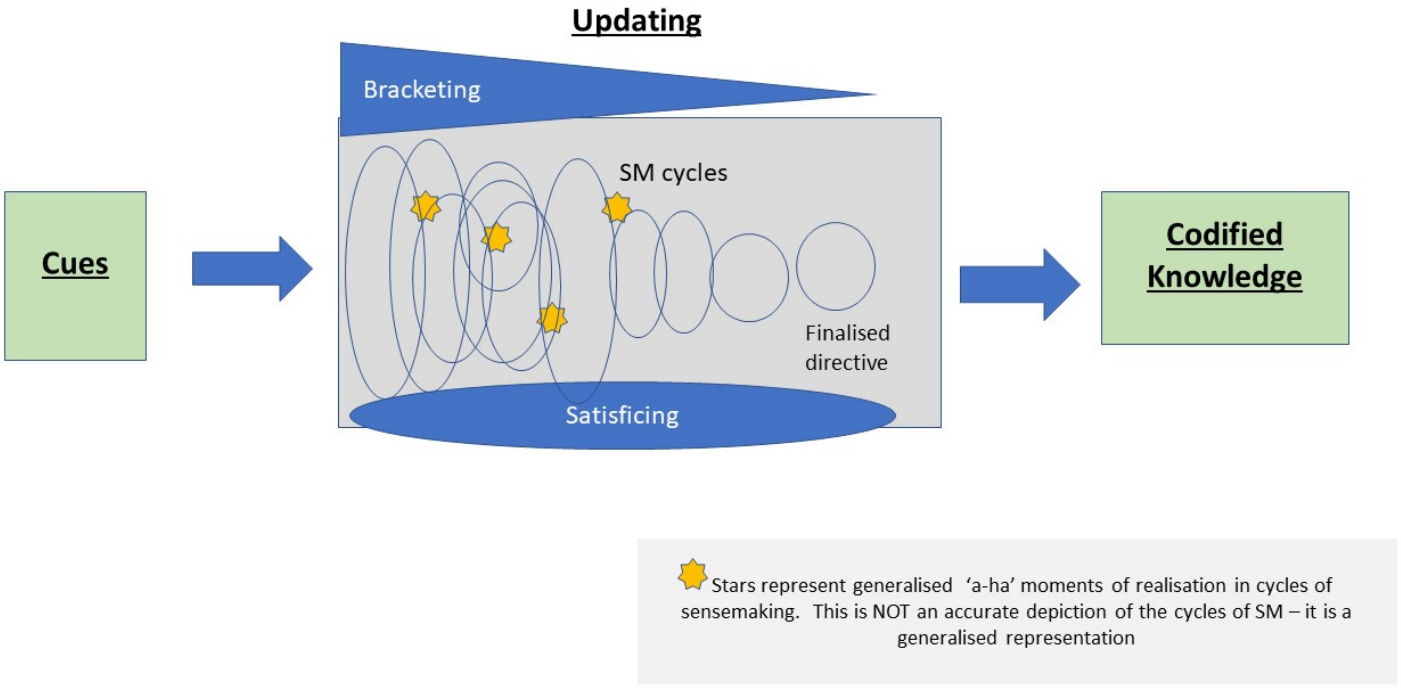


Figure 6. 4 Conceptual framework of information dynamics in long duration crisis sensemaking

In the findings for RQ1, in the section titled "Drivers of iterations of sensemaking", I presented the driver for PSM as being in RSM. It is in RSM that cues from the crisis event are interpreted, and further actions are taken, such as to do deeper investigations, or to transition into PSM and create or revise a directive. These directives are implemented in field sites that are far removed from the OSSAC. The implemented directives generate cues, which are then sent back to the OSSAC for interpretation. The cues that drive the work of the OSSAC mainly originate from outside of the OSSAC (e.g. feedback from field sites, new SARS cases)(figure 6.5).

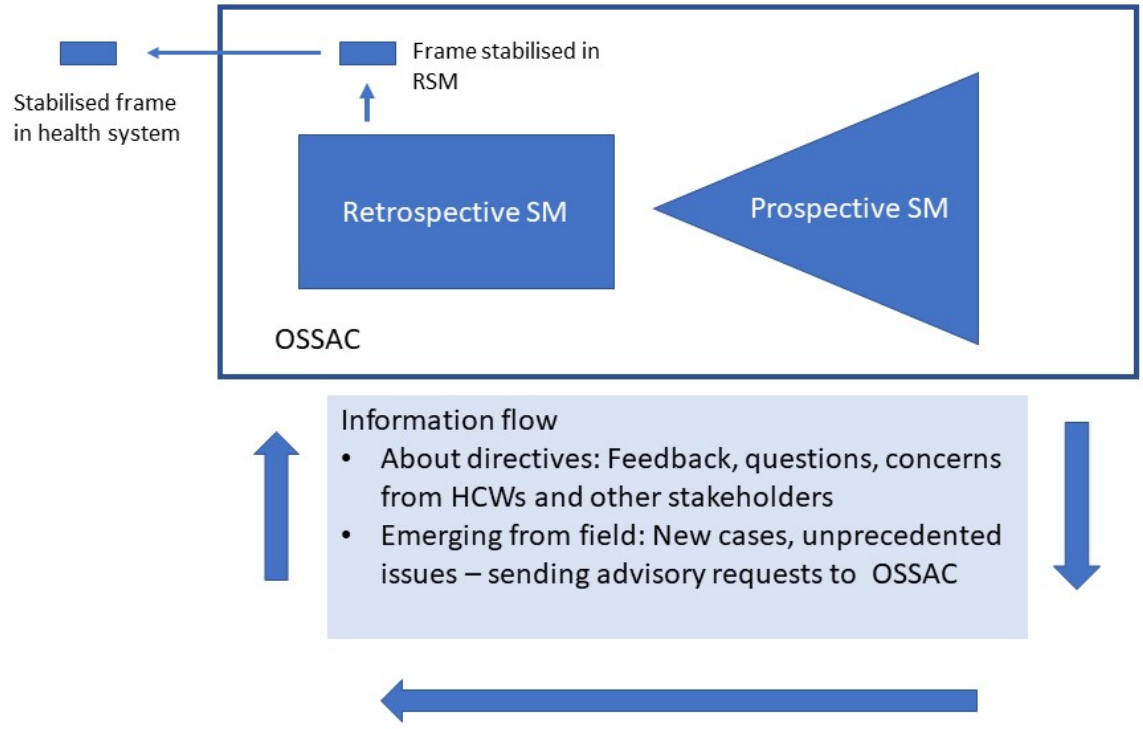


Figure 6. 5 Cues driving sensemaking from outside of the OSSAC

There is dynamic flow of information exchanged between the greater health system and the OSSAC. The OSSAC is an entity with permeable boundaries, both input (cues) and output (directives and other products) crosses the OSSAC boundary. Thus, the OSSAC can

be viewed as an open system – they have boundaries, but information flows in and out of those boundaries.

The regulation of the OSSAC is also applied from the greater (external) health system; they received a high volume of requests for guidance, particularly in the beginning of the crisis due to the magnitude of the unknowns. As the crisis period progressed, the directives were revised iteratively, driven by cues such as new SARS cases, or feedback from field sites. From cycles of implementation and revision, they eventually reached a point of no further SARS cases, which attenuated the drive in RSM with fewer cues to drive the sensemaking process. This led to the attenuation of the crisis, and the work of the OSSAC.

The revisions are a product of the OSSAC learning through the crisis: learning about the disease, and how to manage it, thereby codifying knowledge into the overall SARS frame. The solidifying of the SARS frame occurs in RSM (Figures 6.3, 6.5) as the OSSAC review new cues to see what worked, and what didn't in previous iterations of directives – this is the interpretation phase of RSM. Then when they have consensus of plausibility of the meaning created, that adds to stabilising the SARS frame.

After the final versions of the directives are released, the OSSAC no longer needs to engage in sensemaking to develop and revise the directive(s). The directive shifts from the meso level (the OSSAC team developing and revising it) to being a stabilised part of the SARS frame at the macro level – and so the meso (team) and macro (team to system level) levels (House, Rousseau, & Thomas-Hunt, 1995) are further connected.

In viewing the OSSAC as an open system, they were regulated by factors outside of their boundary – particularly by the balance between knowns (codified knowledge) and unknowns in the greater health system (represented by the MoHLTC). In Figures 6.3 and 6.5, the drive for OSSAC sensemaking is from the cues received in RSM, such as new SARS cases, or feedback from the field. These cues represent the unknown – the uncertainties, and ambiguities of not having existing frames that include guidance of how to handle the emerging disease. As they gained more knowledge about SARS, and learned through the crisis with iterations of directives, they gained more control. With the great volume of

unknowns in the beginning, the see-saw tipped under the weight, which indicates a high level of risk perceived by the health system (Figure 6.6). However, through learning and codifying knowledge throughout the crisis period, more weight is gained in codified knowledge. As the see-saw tips more towards control, a threshold is reached, which attenuates the crisis. The threshold is the system's assessment that the level of unknowns does not merit the level of attention and energy investment that activating crisis sensemaking requires, which is represented by the two incubation periods of the SARS virus, as defined by KDMs. Next, I will further discuss each side of the see-saw.

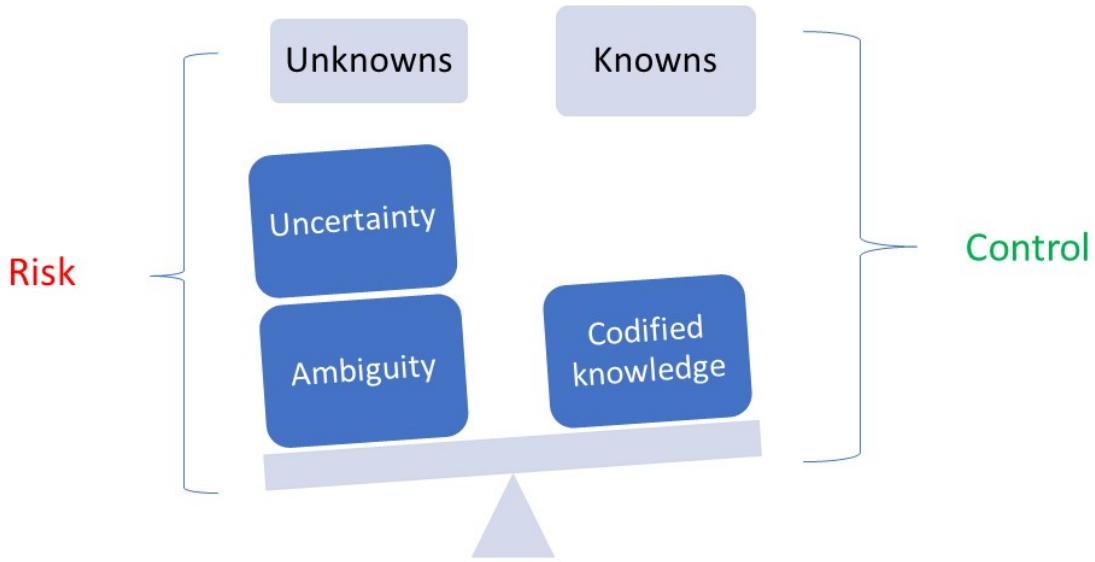


Figure 6. 6 OSSAC open system regulation

Unknowns: Uncertainty and ambiguity = Risk

Uncertainty is not being able to readily match cues to existing frames; ambiguity is being able to match cues to two or more possible frames.

In the RQ1 and RQ2 findings chapters, I presented the multitude of unknowns that held many uncertainties and ambiguities, such as not knowing the cause of the disease, not having a lab test or treatment, and also not knowing how SARS was transmitted.

These unknowns carry a great deal of risk, especially for an emerging disease, because the consequences cannot be calculated. Scenarios can be generated, but without prior experience with the disease there are no parallels to accurately draw on.

The WHO manual on rapid risk assessment of acute public health events (WHO, 2012), defines risk as: "the likelihood of the occurrence and the likely magnitude of the consequences of an adverse event during a specified period" (pg 30). Risk assessment is the gathering, interpreting, and documenting of information to assign a level of risk, which is the risk characterization. Based on the level of risk, control measures are implemented, and then monitored and evaluated (WHO, 2012). The key question officials ask is: "'what is the public health risk of the event' (i.e. what is the risk related to exposure to a particular hazard in a particular location, or to a particular population at a particular time)?" (WHO, 2012, p. 10). The risk assessment is based on three overlapping domains: hazard, context, and exposure.

Hazard

The hazard is the source of the threat. One of the issues with the SARS crisis was that as an emerging disease, the hazard was unknown. The WHO states that with less specificity, the broader the list of possible hazards (WHO, 2012), and this was also true in the SARS event, as in the early days of the crisis, they were unsure if the disease was caused by a coronavirus, a metapneumovirus, a combination of the viruses, or something else altogether. There was great uncertainty and ambiguity.

Exposure

This is the evaluation of the exposure of individuals and populations to likely hazards (WHO, 2012). The key output of the assessment is an estimate of the number of people or groups known or likely to have been exposed, and number of exposed people or groups

who are likely to be susceptible (i.e capable of getting a disease because they are not immune). Again, the KDMs were plagued by unknowns. They did not know the mode of transmission, or incubation period, and did not have much information for the case fatality rate or the estimation for the potential for transmission – all of this information is required to adequately calculate exposure (WHO, 2012). Additionally, there was no vaccine.

Context

Context is the assessment of the environment, for example, Toronto during the SARS crisis, and the health/hospital system and the community at large – including cultural practises and beliefs (WHO, 2012).

Hazard, exposure, and context are assessed together to do an overall characterisation of risk.

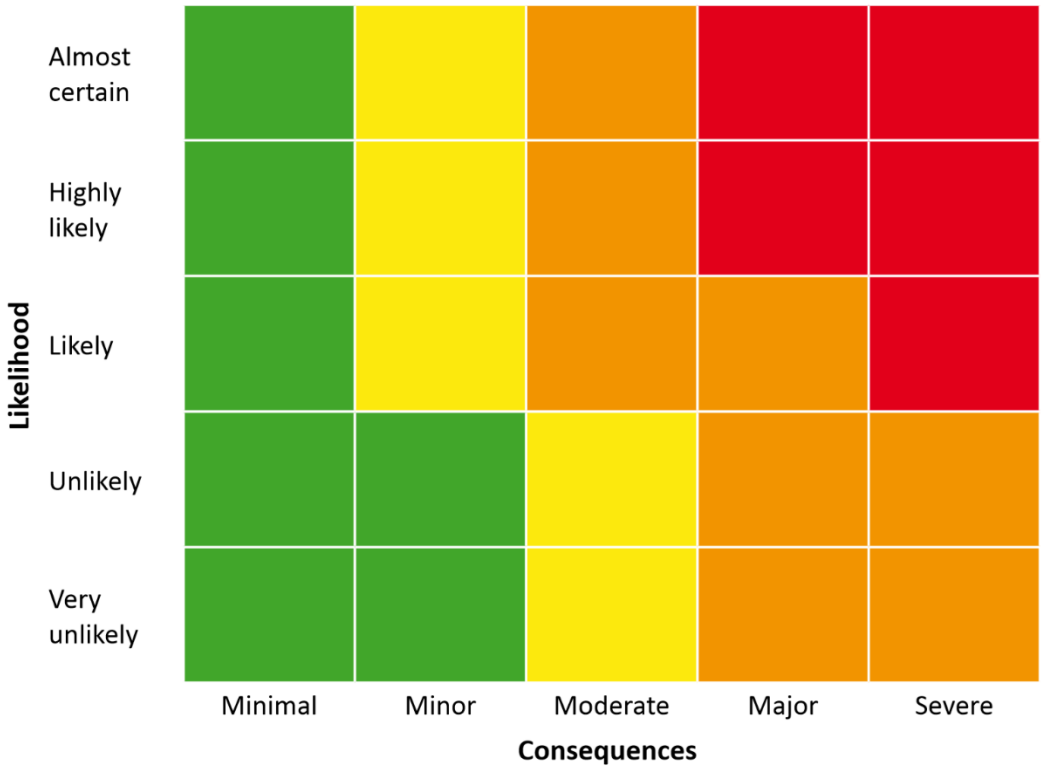


Figure 6. 7 WHO risk matrix (WHO, 2012, p.20)

Without being able to quantify or qualify likelihood in the risk assessment (Figure 6.7), there is no clear guidance on the level of control measures or decision-making. One of the key decisions that need to be made, as discussed in the literature review, is if there is a response, what is the scale and magnitude of the response (Lipsitch et al., 2011). There are a multitude of decisions the POC must make, and in the absence of information, there is a lack of clarity of how to restore control. They are making their way in the dark, without prior guidance. And, as discussed earlier in this thesis, without knowledge of the level of risk, in a context of great uncertainty, they generally implemented the highest precautions.

Knowns: codified knowledge (directives) = control

With known threats like chicken pox or influenza, IPAC practitioners have a standard toolkit of protocols (as discussed in RQ2 findings)– they know what to do because they know the mode of transmission and have experience with those diseases. There is a body of academic literature they can access for guidance based on rigorous evidence-based research. With greater knowns, and a clear set of protocols of what to do, there is greater control – the system has a response for anticipated events, based on research and experience with that particular disease.

When facing an emerging disease like SARS, the unknowns far outweigh the knowns, and it compounds the challenge that in addition to managing an outbreak, they also must go through the process of discovery of the agent, incubation period, mode of transmission, and multiple other data points that help experts assess risk and make decisions. There was a great deal of fear especially as the information in the early days, which was a primal threat to the population's well-being (Maslow, 1943).

Control is the restoration of the stream of experience to what is expected; when new cues fit into known frames. There are unexpected cues, but not enough magnitude to trigger system-wide crisis sensemaking. The relative levels of unknowns to knowns is dynamic and changing, but unless the relative difference crosses a threshold, the crisis period

sensemaking will not be triggered. As the health system approached the two incubation periods with no new cases of SARS, the balance was increasingly shifting towards control (Figure 6.6). With less urgency in the health system, and thus less demand for the OSSAC to process new urgent cues in RSM, the OSSAC transitioned to planning how to return the health system back to normal, but a "new normal" with heightened protocols.

The process of the health system regaining control was assisted by the refining of the directives. The process of revising and refining directives can also be viewed as a process of learning. I will discuss the impact of the OSSAC learning, next.

Learning through crisis, and the impact of the knowledge gained

Argyris defines learning as the "detection and correction of errors, and error as any feature of knowledge or of knowing that makes action ineffective. Error is a mismatch: a condition of learning, and matching a second condition of learning. The detection and correction of error produces learning and the lack of either or both inhibits learning" (1976, p. 365). As learning is "detection" and "correction" of errors, then it necessitates a change from the state before, to the state after the "correction."

A change, or shift, can be miniscule or monumental. Kuhn is a well-known science historian, and his concept of the paradigm shift follows how systems of thought are radically changed with the emergence of novelty. Scientists then engage in puzzle-solving to reconcile this novelty, and this new understanding, which is "incommensurate" (Collins, 2016) with the past system of thought, then shifts the paradigm as it is "corrected" into the new state of understanding (Kuhn, 2012).

In the table below, I compare Schön, Argyris, and Kuhn in their concepts of learning and its' impact. At the three different levels of analysis (individual, organisational, and grand narrative level), learning is characterised by the detection of novelty or "error", and a process of interpretation, followed by action or "correction" and change.

Table 6. 1 Key thinkers on learning and codification of knowledge

Author	Concept	Explanation
	Individual/ practitioner level	
Schön (Schön, 1995, 2001)	The Reflective Practitioner	Detection of error is based on a practitioner's tacit knowledge, or 'intuition' – and often the mechanism of correction is tacit – an expert finds it difficult or impossible to verbalise For example, how an individual practitioner learns: A basketball player thinks of multiple paths forward on the court; he selects the path he thinks is best. After the play, he goes over what happened in his mind, and considers if the play went according to how he anticipated, and why.
	Organisational level	
Argyris (Argyris, 1976, 1977)	Learning as the detection and correction of errors	Single loop and double loop learning – questioning the underlying principles behind the rule "hidden theories of action", and considering if there is a better way. For example: Thermostat correcting room temp to set temp as single loop learning; thermostat questioning if the temperature should be set differently, and why – is double loop learning.
	Grand narratives level	
Kuhn (2012)	Paradigm shifts	Kuhn argues that knowledge is not built through cumulation, such as in a Darwinian micro-evolutionary process, but in discovering novelty leading to puzzling through, and resulting in paradigm shifts. Kuhn's examples are major scientific shifts such as the flat earth to a sphere; discovery of the X-ray; traditional medicine to evidence-based medicine

While this thesis is focused on the social aspect of sensemaking, the individual and social are entwined; an individual must express ideas into the social space for social sensemaking to take place. The individual experts serving on the OSSAC drew on their own knowledge and experience in contributing to the social discourse on creating and revising the directives. Participants spoke of expressing their expertise, based on their knowledge of: hospitals and workflow, people (decision makers in the health system, leaders), science and medicine, and clinical experience. This is a blend of explicit and tacit knowledge, stemming from the Schön individual level of analysis.

As these people work together as a team, and engage is discursive sensemaking, they create and revise together directives that are implemented into the health system. Also, together, they review and interpret feedback, from HCWs and from the system itself, such as from new potential cases of SARS. Through sensemaking, and several 'a-ha moments', they learned about the character of SARS, and were able to hone their responses, and directives for greater effectiveness, which ultimately resulted in stopping transmission (in SARS I). The team learning is at the Argyris level of analysis.

The next level of analysis is Kuhn, however, a grand narrative is too great a scope to attribute to the level of change that came as a result of the learning through the crisis. The learning from the SARS crisis was not a paradigm shift: we already know viruses exist and have standard toolkits of how to manage infectious diseases. We also know about emerging diseases, and hospital related diseases, and public health. The changes stemming from SARS were more about changing practices to be more stringent, which was termed the "new Normal" (Appendix 5.1 is the letter outlining the expectations of the New Normal). Furthermore, in Ontario, the hospitals are not in one health system – each hospital functions as an independent entity, an organisation within itself. The OSSAC and POC were rolling out directives that cross-cut multiple jurisdictions and organisations. Thus, the impact of the learning through, and from, the SARS crisis, is at a level between organisational and grand narrative. Also, the "new Normal" affected the collection of routines and practices in a system (such as Hospital Systems or Public Health Systems),

which is greater than an organisational level. A "Hospital System" would be the concept of Hospital(s) and the routines, practices, assumptions therein.

Kuhn's description of the process of discovery parallels Weickian organisational sensemaking, and both are at different levels of analysis. Kuhn states:

> "Discovery commences with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science. It then continues with a more or less extended exploration of the area of anomaly. And it closes only when the paradigm theory has been adjusted so that the anomalous has become the expected. Assimilating a new sort of fact demands a more than additive adjustment of theory, and until that adjustment is completed – until the scientist has learned to see nature in a different way- the new fact is not quite a scientific fact at all." (Kuhn, 2012, p. 53)

Paradigm shifts vs adding knowledge within a paradigm

Winch (1958) discusses what happens when new ideas come into a society, and replace old ideas. He contrasts ideas that change the structure of paradigms, and ideas that change the substance of an existing paradigm, but the structure stays the same. The first one can be referred to as a Kuhnian paradigm shift. Winch gives the example of a scientist making the discovery of a new germ responsible for a certain disease. Winch states the scientist, while discovering a new germ, has made a discovery within the existing framework of ideas – with the assumption that the idea of germs already exists in the scientific language of the scientists' world. Then, he contrasts that to the very first discovery of a germ, and the very first formulation of a germ theory. "This was a much more radically new departure, involving not merely a new factual discovery within an existing way of looking at things, but a completely new way of looking at the whole problem of the causation of diseases, the adoption of new diagnostic techniques, the asking of new kinds of questions about illnesses, and so on" (Winch, 1958, p. 121-122). Winch goes on to state that it is a socially created, integrated, and implemented change (a paradigm shift) among the practitioners within the field of medicine. The concept of the germ is integrated to the identity and

meaning of medical practise; for example, a doctor who claimed to accept germ theory, and claimed to aim to reduce the incidence of disease, then did not isolate infectious patients would be behaving in a "self-contradictory and unintelligible manner" (Winch, 1958, p. 122). Mary Jo Nye (2016) also discusses the evolution in the history of science, where many in the field have now re-interpreted major changes in grand narratives as gradual, rather than paradigm shifts.

Similarly, the learning of the OSSAC and internationally in facing SARS was not a paradigm shift, but it added a new concept within the paradigm of infectious diseases – it added the SARS frame, and it changed the normalised Practice within hospitals.

Successive learning cycles

Learning through a crisis, particularly a long duration crisis, is not a linear process with multiple discrete periods of "detection and correction of errors." Rather, it is a cumulative process. As the OSSAC learned throughout the crisis period, particularly the learnings that were described by participants as 'a-ha moments' – in the findings we see that these learnings can lead to trajectory changes. This iterative process of changing trajectory, gathering cues and interpreting through sensemaking, led to more high value targeting of team attention, in order to be more effective in the goal of limiting transmission. This was not linear – each successive trajectory changed was built on the cumulative experience and learning from the sensemaking before.

Argyris comments on two variables that can be altered to increase the effectiveness of learning: "One is the degree to which interpersonal, group, intergroup, and bureaucratic factors produce valid information for the decision makers to use to monitor the effectiveness of their decisions. The other is the receptivity to corrective feedback of the decision-making unit- that is, individual, group, or organization" (Argyris, 1976, p. 365). As directives were implemented iteratively, the OSSAC were able to get feedback from HCWs,

and other stakeholders, and also monitor epidemiology to gain quantitative feedback on the effectiveness of the protocols. Through each iteration, they are able to change trajectory if required, to hone their efforts in reducing and stopping transmission.

Similarly, research on an organisation facing three successive rare events also found that the learning was not additive, there was a cumulative strengthening of organisational practices and routines. The researchers noted that the organising routines of interpreting, relating, and re-structuring were strengthened as the organisation as they went through the sensemaking process through the three events (Christianson et al., 2009).

Section 2: Key contributions

- RQ2 conceptual framework of EAG information dynamics during a long duration crisis
- Conceptual framework of open systems regulation of EAG sensemaking, by greater health system's balance of knowns and unknowns
- OSSAC learning in creating and revising directives builds knowledge that impacts greater than the organisational level, but not at the grand narratives (or paradigm) level.

SECTION 3: OSSAC sensemaking process as Design Thinking

As the OSSAC began their work to create protocols to limit transmission of the unknown agent, they found that there were no pre-existing templates to work from, in terms of a pandemic plan. They had to borrow from other places, such as using the Health Canada guidelines, and the pandemic plan from another province. As they worked, they - along with the rest of the world, were engaging in discovery and learning of the disease at a rapid pace. Due to no pre-existing plans, much of their in developing directives was borrowed, adapted… and designed.

Cross (1982) describes design thinking as synthesis - building provisional solutions based on the cues at hand, as compared to scientific thinking which is analytic, and looks for the underlying principles or patterns of the cues prior to developing an optimal solution. Designers engage in synthesis through abductive sensemaking (Kolko, 2010). Weick explains abduction as the ability to "generate plausible conjectures about the meaning of fragmentary evidence" (2010). Designers study the collection of cues they have and generate plausible possibilities (or conjectures) in creating or making a solution. This is done internally (in an individual's mind), digitally, and also spatially – through the use of objects, sticky notes, whiteboards, etc (Kolko, 2010).

Schön has a broader definition of design as the "more inclusive process making things (including representations of things to be built) under conditions of complexity and uncertainty. This broader sense of designing includes, for example, a lawyer's design of a case or legal argument, a physician's construction of a diagnosis and course of treatment…" (Schön, 1995, p. 32-33). The OSSAC were forced by necessity to shift to a new way of thinking, when faced with an emerging disease. There were no existing protocols for SARS as they had never seen it before. In their PSM process, they generated scenarios with provisional solutions using bricolage – such as borrowing from joint surgery protocols by considering the Stryker suit (Table 4.8). In RSM, as they considered the data from HCWs and epidemiology, with an analytic way of thinking through considering the possible explanations for the data they've received – for example, in the RQ1 findings, one of the possible explanations for continuing to have new SARS cases among HCWs "through precautions" was the bio burden in the rooms, and they sought data on how many SARS cases were cleaning staff. In this analytic approach, they have a hypothesis, and go forth in collecting data to prove/disprove the possibility.

The OSSAC were operating at the edge of codified knowledge; they were engaging in abductive sensemaking to develop directives, and in the sensemaking endeavor, they were learning how to improve the directives through multiple iterations of feedback and revisions. Kuhn (2012) states that at the brink of scientific discovery, or "pre-paradigm periods and during the crises that lead to large-scale changes of paradigm, scientists usually

develop many speculative and unarticulated theories that can themselves point the way to discovery" (p.61). The "speculative and unarticulated theories" are indicative of abductive thinking – generating possibilities of explanations of cues. In science, which is dominated by analytic and deductive reasoning, during a time of discovery there is a period of abductive thinking. Kuhn continues to state: "Only as experiment and tentative theory are together articulated to a match does the discovery emerge and the theory become a paradigm" (p. 61). Just as the OSSAC experienced, it is only as the "sense" they have made (the directives) matches what is expected (that the protocols created will control/stop transmission), then the directives become a stabilised part of the SARS frame, and in turn further stabilising the overall frame.

Section 3: Key contribution

- Sensemaking at the edge of codified knowledge parallels design thinking

SECTION 4: Social library of frames

Role of frames in sensemaking

Sensemaking is a process of matching cues to frames. For the OSSAC, in RSM, they were adapting frames to create meaning from the cues, for example, interpreting the information they had on the disease so far, and deciding that influenza was the nearest match, and using the influenza model to base the first directives on. In PSM, they were generating scenarios (based on known frames) in order to write directives, and would seek out further cues (information) as the situation required. They would borrow frames to adapt what was needed in their specific situation, such as using health Canada guidelines as templates in writing directives.

The role of frames is critical in both RSM and PSM because the outcomes depend on the frames available for adaptation.

In RSM, for cues that are easily matched to frames, there is not much stretching that needs to done for the match. However, for cues that have no clear match, such as an emerging disease with no pre-existing frame, more effort is required to interpret which frame(s) can be drawn on to adapt into a new frame to match the current cues. For example, the CIA received a report on terrorists learning to fly prior to the 9/11 tragedy. At that time, there were no pre-existing frames that would trigger sensemaking about this cue (Colville et al., 2012).

In the findings chapter for RQ1, I discussed the social library of frames, which refers to the collective knowledge and experience of the experts at the table, serving on the committee. Throughout the six weeks of the crisis, experts serve on the committee for a few days and up to a few weeks; thus, the frames at the table are dynamic and changing, dependent on who is on the Committee at that time. The library of frames is a critical function of the interpretation in RSM and PSM.

A similar concept to the social library of frames is the "response repertoire": "the stock of routines, habits, and roles that have been experienced, as well as the capability to recombine portions of the stock in novel ways. We emphasize that response repertoires include both realized and latent potential… for much of the stock remains outside awareness and is taken for granted until moments of interruption and attempts at recovery call attention to it or require actions that draw upon it" (Christianson et al., 2009, p. 846-7). The differences are that the response repertoire was explored at the organisational level, and the social library of frames refers specifically to the team level. Furthermore, this research study has explored how the social library of frames is critical to both RSM and PSM, whereas the response repertoire was a function of how the organisation responded to three successive rare events, with Weickian sensemaking. They did not explicitly study prospective sensemaking and the response repertoire.

In a crisis situation, the library of frames is particularly important to widen the pool of potential frames (the selection of frames in a library) to be drawn from for adaptation in sensemaking. This can be seen in wild imagination for RSM, and bricolage in PSM.

Wild imagination

Lagadec (2009) suggests that in our hypercomplex world of crises that are unimaginable, we need people who can generate wild scenarios to create meaning from cues. The cost could be catastrophic: for example, Weick (1993) unpacks the case study of a wildfire. When the smokejumpers arrived, the cues they received, including the magnitude of the fire, was unexpected, to the point where they were not able to match those cues to their existing frames. Weick refers to this phenomenon as a "cosmology episode" because the cues an actor is receiving do not match frames that comprise their understanding of the world.

Wild imagination can assist in the RSM process by considering a wider possibility of interpretations for cues. Rather than taking the path to the nearest possible frame, employing imagination to consider multiple interpretations across a continuum of plausibility. For example, the OSSAC were generating possibilities to try to explain why there was transmission among HCWs even after precautions were implemented. One of the possibilities was that the agent was sitting on surfaces in hospital rooms and was being spread by HCWs touching surfaces and self-contaminating. They enacted this interpretation by seeking out information on how many HCWs were cleaning staff, and also looking for ways to reduce bioburden in rooms. This possibility was a function of individuals and team knowledge of how transmission occurs, and considering all the possibilities that they know from personal knowledge both tacit and explicit, and then sharing that into the social space to be considered by the team.

In contrast, when the OSSAC faced cues that couldn't be explained – there were no potential frames to match the cues, they felt "stymied" (Dr. Grahame). Sensemaking

cannot proceed when there are no potential frames to match cues, and the Easter period where 11 new cases occurred "through precautions" could have been a step towards a cosmology episode (see Table 4.8). When events occur that seem to violate "first principles," due to the socially shared strength of certainty in these principles, it can be shocking. The cues at that time could have been interpreted that the "first principles" were not holding true.

Bricolage

Bricolage, discussed in the findings for RQ1, is the utilisation of existing frames, and adapting them to the situation at hand It is a function of creativity. Weick (1993) discusses the example of Dodge, who when faced with the same fire as the other firejumpers in the example above, was able to make an imaginative leap to something he had seen before, and was able to innovate in real-time to burn an escape fire around him. He survived the fire. He was able to draw on frames in his mind, and creatively adapt in the moment to save his life.

In the findings for RQ1, I provided examples of bricolage among the OSSAC, including the PPE they considered in protecting HCWs after the Easter weekend cases (Table 4.8). They were able to generate multiple possibilities, including Stryker suits. These suits are worn by surgeons to protect patients from being contaminated by the surgeon during joint surgery. Someone thought that if a Stryker suit can protect a patient from any organisms coming from the surgeon, then perhaps a Stryker suit can be adapted to the SARS situation, and can protect an HCW from any agent being transmitted from the patient. It was an imaginative leap, from someone's individual knowledge frame, verbalised and codified into the social space, in PSM.

The selection in the library of frames is critical to RSM and PSM function – the wider the library, the more frames there are to draw on for adaptation, particularly in an emerging disease crisis where not much is known, and imagination and adaptation are required.

Expanding the library of frames potentially increases sensitivity to weak cues

The cycles of sensemaking the OSSAC went through to create and revise directives was a process of codifying knowledge as represented by the iterative revisions and refinement of the directives. Experts were recruited to contribute their knowledge and skills for the crisis response. Leonard & Sensiper (1998) describe knowledge as: "information that is relevant, actionable, and based at least partially on experience" (p. 113). They also posit that knowledge exists on a spectrum, "at one extreme it is almost completely tacit, that is, semiconscious and unconscious knowledge held in peoples' heads and bodies. At the other end of the spectrum, knowledge is almost completely explicit, or codified, structured, and accessible to people other than the individuals originating it" (p. 113).

Nonaka & Takeuchi (1995) explain the dynamic relationship between tacit and explicit knowledge as: "explicit knowledge is shared through a combination process and becomes tacit through internalization; tacit knowledge is shared through a socialization process and becomes explicit through externalization" (Leonard & Sensiper, 1998, p. 113).

While most research discusses tacit knowledge as a function of the individual, there are also functions of social tacit knowledge (Collins, 2007) – the knowledge shared in a group, such as a community of practise, that is not easily verbalised, or can't be verbalised, but is mainly passed on through shared observation and apprenticeship (Leonard & Sensiper, 1998).

As SARS was an emerging disease, there was no codified knowledge for this specific disease, no SARS frame, and experts were forced to rely on other disease frames, and their own tacit knowledge, to be verbalised into the group discussion when needed. As discussed above, they employed wild imagination and bricolage in responding to the crisis, in the endeavor to stop transmission of the SARS virus.

With more experience, practitioners develop a greater collection in their personal library of frames, and may develop the tacit ability or "capacity" to sense weak cues that could eventually develop into crises. That is, with more experience (and becoming 'experts'), there is a greater likelihood of sensing weak cues (Rerup, 2009; Whiteman & Cooper, 2011) which then allows the potential for stopping a crisis before it starts, or at least mitigating the impact.

An example of anticipation is the OSSAC in creating a new classification – the Person Under Investigation or PUI (this was discussed in RQ2 findings). The experts noted that the case definition of SARS only included people with an epi-link; yet doctors saw patients that had the clinical characteristics of SARS. If these people had SARS but no epi-link, they could have been transmitting the disease and not being tracked by the system. Using their experience, or 'gut feeling' – they created the PUI category to get those patients into the system for care, and tracking, even though they were not officially tagged as probable or suspect SARS cases.

Section 4: Key contributions

- Concept of social library of frames and how it is critical to sensemaking
- Greater library of frames has potential to increase sensitivity to weak cues, and anticipate precursors to crisis

SECTION 5: Implications, limitations and future research

Implications for Practice: Pioneering at the Edge of codified knowledge

As Dr. Young (2006) stated in his reflections, in modern medicine, there are several levels of quality of information to reach to make a decision with certainty; however, in the

urgency of an outbreak, necessity dictates that they must make decisions regardless of the state of knowledge.

For the OSSAC, they were tasked to write protocols that were immediately implemented in the field (hospitals) that governed all aspects of hospital life. The added challenge was that SARS was an emerging disease, and much was unknown. They engaged in abductive thinking in generating provisional solutions that were constantly reviewed, revised, and refined.

Drs. Goodman, Borjes, and others have stated that it was difficult for many to shift thinking, to take action when not much is known. That is the benefit of abductive thinking – its nature is to generate plausible solutions and enact and iterate. It does not assume perfection, but satisfices (Simon, 1956) – a solution that works, but may not be what is idealised as the one 'optimal' solution. As the OSSAC worked to create directives, they were pioneering at the edge of codified knowledge. They were engaging in synthesis by generating possibilities based on the cues at hand, and analysing feedback and other cues from the health system on a regular basis. They would then revise and re-implement directives in reaction to the new information. Being able to adapt frames with imagination, and build provisional solutions based on incomplete information (abduction) is required in a crisis situation. As Dr. Borjes notes:

> "people want to decide and they want to decide once… you can't do that during outbreaks, because outbreaks by their nature are mobile changing things. And one of the things we were unprepared for was precisely that – that it is ok if you are doing one thing today and something else tomorrow, because that is in the nature of new diseases and finding things out. For people in this stage, that was the hardest piece."

As Dr. Borjes states, outbreaks by their "nature" are mobile and changing and being able to engage in "design thinking" may be a very practical intervention in preparation for future crises. It gives people a knowledge frame of how to approach a situation when they face the unknown; design thinking may be used as a tool on how to build solutions. When people have more frames to draw on, this adds to their capacity, and ability to handle a diversity of situations. Weick explains this:

> "Capacity and response repertoire affect crisis perception, because people see those events they feel they have the capacity to do something about. As capacities change, so too do perceptions and actions. This relationship is one of the crucial leverage points to improve crisis management. … If people think they can do lots of things, then they can afford to pay attention to a wider variety of inputs because, whatever they see, they will have some probability that the person will see the specific change that needs to be made to dampen the crisis. Accuracy in perception comes from an expanded response capacity… the joint beliefs 'I have capacity' and 'capacity makes a difference', should reduce defensive perception and allow people to see more. As they see more, there is a greater probability that they will see some place where their intervention can make a difference (Weick, 1988, p. 311).

Generalisability

This study provides an opportunity to illuminate how experts interpreted information in extraordinary circumstances – it is "unusually revelatory" and an "extreme exemplar" (Eisenhardt & Graebner, 2007). This PhD study developed conceptual frameworks on EAG's (1) social sensemaking process in a linear representation of one directive (RQ1), and (2), the information dynamics of sensemaking during a long duration crisis (RQ2). Furthermore, in this discussion chapter, an EAG sensemaking regulation theory was posited (Figure 6.6), where the sensemaking of the EAG is regulated by the balance of knowns and unknowns of the greater health system.

As this is study is focusing on a specific team during a particular crisis period, there may be limited generalisability. The research study was situated in Canada, in a large city (approximately 5 million people), with no pre-existing pandemic plan. Furthermore, the crisis was an emerging disease outbreak.

However, as noted earlier, Weick has stated that:

> "crisis sensemaking … is not all that different from sensemaking that occurs in response to breaches in everyday life. The sequences are similar but the

intensities are different. There is an interruption, followed by moments of thought, action to clarify the thinking, and recovery" (K E Weick, 2010).

So, while there are specificities in the level of analysis (team), the context (Canada), and the type of crisis (an emerging disease), there may be aspects of applicability of the theory developed in this PhD research – to be discussed in recommendations for further research.

Limitations

The limitations of this research include the nature of historical research; I was not able to gather real-time data and/or observe social sensemaking during the actual practise of creating and revising directives. The core data analysed was participants' recollections of a crisis event from 15+ years ago, and many could not remember details vividly.

Another limitation was that there was missing data from the minutes, which were a source of data for triangulation. Also, the codification of knowledge was represented by directives; however, the OSSAC were also engaged in many other activities in their role as advisors, such as one-off questions from hospitals. Following the entire day of activities of the OSSAC may have given a more robust picture of sensemaking.

Recommendations for future research

From tracking academic literature up to this point, this research study provides the first conceptual frameworks for long duration crisis sensemaking, particularly for an emerging disease**.** Previous researchers have looked at acute crisis sensemaking, or long duration steady-state sensemaking, and this research bridges that gap. There is still not a lot of research in long duration crisis sensemaking (Ansell et al., 2010; Hutton, 2018; Keller et al., 2012), and there are many areas for further research.

There are rich resources within this thesis for future researchers to take forward in building and testing theory, such as gathering and analysing real-time data (transcripts or

recordings of meetings) during the next emerging disease. This was a retrospective research study, and I was not able to observe in real-time what the sensemaking and discourse around the OSSAC table, and that is why I would suggest recordings or transcripts of meetings. As noted in the literature review, observational research may not be practical as emerging disease crises cannot be anticipated, and the logistics of arranging for observation or ethnography during the crisis response is likely not feasible.

Furthermore, this study was on an emerging disease; there could be differences in long duration crisis sensemaking between an emerging disease and a known disease such as Ebola. The OSSAC and other scientists internationally had to take action in crisis response without knowing what the agent was, or mode of transmission, and a multitude of other information that is needed to make accurate risk assessments and decisions.

Also, in this research, I focused on the social aspect of sensemaking. It would be warranted to conduct a study on the interrelationship between cognitive and social sensemaking during a long duration crisis. This has been done in a steady-state period within a design firm (Stigliani & Ravasi, 2012).

In my research interviews with the OSSAC, a few stated the need for improvement of the management structure for outbreaks. Currently, management structures that are mainly used for acute crises such as wildfires, tsunamis, and hurricanes are being used for managing outbreaks. Research findings from this study might be applied into considering possibilities for future design. For example, there is strong body of research on coordination of multiple agencies in crisis response (Bharosa et al., 2010); but we also need more research for crisis management longitudinally and being able to map events and decisions from months or even years ago to the current day, for a long duration crisis. This also has applications into information systems design (Kang & Stasko, 2014) for intelligence analysis and coordination during a long duration crisis.

Chapter 7: Conclusions

When I began the PhD journey, I was inspired by a commentary in the New England Journal of Medicine on the Ebola 2014 outbreak (Farrar & Piot, 2014) calling the international community to more effective and prompt crisis response to outbreaks. In this endeavor, I aimed to explore the social sensemaking of expert advisory groups who are tasked to advise on scientific/medical aspect of the disease during an outbreak.

I studied the Ontario SARS Scientific Advisory Committee (OSSAC) and how they created and revised directives over the six weeks of the Canada SARS I crisis, in early 2003. The research questions were:

- **Research Question 1 (RQ1):** What is the general EAG social sensemaking process of creating and revising advice to KDMs during a long duration emerging disease crisis?
- **Research Question 2 (RQ2):** What are the information dynamics of long duration social sensemaking from the EAG perspective during an emerging disease crisis?

Following a constructivist grounded theory strategy, I conducted several iterations of data collection and analysis. The findings include a conceptual framework of EAG social sensemaking through a long duration crisis (RQ1), depicting the sequential process of a stream of sensemaking (the creation and revision of one directive). A second conceptual framework on the information dynamics of long duration social sensemaking (RQ2) reflects the learning over the course of the crisis period. Finally, a third conceptual framework on the regulation of expert advisory group sensemaking as a balance between the knowns and unknowns in the greater health system is presented in the Discussion chapter.

Reflection on PhD journey

The structure of this thesis reflects a narrative journey. As I study the evolving process of sensemaking, it was important to also reflect that in the writing and presentation of the thesis. A research project is also an exercise in long duration sensemaking – there is a trigger, followed by multiple extended cycles of meaning creation, followed by evaluation for plausibility, and the completion of the thesis and attenuation of sensemaking.

I retained the content of the literature review sensemaking section from the doctoral proposal that was conducted several years earlier, as it is an intact representation of my expectation at the time. I presented the sensemaking conceptual framework based on the literature review and compared it in the Discussion chapter to the findings after the iterative data collection and analysis. To show the research evolution, I needed to keep the literature review as intact as academic rigour would allow. This commitment to transparency to the research process reflects the core of this research study – the sensemaking process.

In the methodology, I discussed what had been initially planned, and how it was adapted as the research process unfolded. It was important to keep that narrative of the methodology process and adaptation as it was fitting with the grounded approach, in conducting research in an under-researched area, in order to build theory (with inductive, deductive, and abductive reasoning).

The findings chapters also reflect the rich data and thinking that come with the grounded approach, and using multiple types of data for triangulation as well as multiple types of reasoning to probe data. Additionally, the research questions look at the process from a linear reductionist view in RQ1, and then a dynamics-view for RQ2. This multiplicity brings a rich, grounded, constructivist picture to an under-researched area, of long duration crisis sensemaking.

Finally, the Discussion brought together the key findings of both RQ1 and RQ2 and offered recommendations for future research, as well as contributions for both policy and practice.

Key contributions

The key contributions and learnings of this study include:

1. A conceptual framework of EAGs social sensemaking through a long duration crisis response. This conceptual framework is the first depiction of retrospective and prospective sensemaking process. The specific context may limit generalisability (as noted in section 5 of the Discussion chapter), however, it also provides a starting point for testing theory in future research. This conceptual framework could also be compared to crisis sensemaking process in other fields, as well as non-crisis long duration sensemaking, such as developing organisational strategic plans.
2. A wider social library of frames facilitates sensemaking, particularly when facing a crisis situation with a multitude of unknowns. A wider selection of frames allows for anticipating, understanding, and adapting to a wider range of unforeseen events.
3. EAGs' long duration crisis sensemaking parallels design thinking in the iterative pattern of implementing solutions followed by iterations of feedback and revisions. In a crisis situation, KDMs must often act with a high level of uncertainty and solutions are provisional as with new information, solutions must be revised and re-implemented. The ability to engage in design thinking in a crisis context, partnered with a wide and diverse social library of frames, may improve crisis response efficacy.
4. The EAG were regulated by the balance of knowns and unknowns in the greater health system (figure 6.6). As knowledge was built over time, there was a greater level of knowns, and more control in the system. This eventually led to attenuation of the crisis period. This conceptual framework of advisory regulation may be applicable to other fields, as the factors involved are not unique to emerging disease outbreaks.

Implications for academics

The conceptual frameworks developed in this thesis are in the context of a long duration crisis, an under-researched area, and could serve as a springboard for further research in extending or testing theory. For example, conducting research with real-time data, such as with transcripts or video or voice recordings, or even conducting the research immediately after a crisis period so that there may be more detailed accounts of events.

The conceptual framework of advisory group regulation by the balance of knowns and unknowns in the greater health system has the potential to be applied into different fields as knowns and unknowns are not unique to public health crises. This topic is germane for further research within public health crisis, and beyond.

Implications for practitioners (experts advising during public health crises)

The wider and more diverse the social library of frames, the greater potential to anticipate, understand, and adapt to crisis events. This has implications for the composition of advisory committees.

One of the challenges in advising in the crisis response was being able to adapt in the mobile and changing context of an outbreak. Design thinking (as a tool) may assist advisors in being able to withstand the pressures of constant change, by being trained in design process. This would include developing a draft (or prototype) and implementing it in the field, receiving feedback, and engaging in revisions iteratively.

Practitioners could partner with academics in conducting research on the effect of the social library of frames and design thinking in advisory committees.

Implications for policymakers

I have separated implications into three groups – for academics, practitioners, and policymakers. However, in reality, there is not such a clear-cut separation. Policymakers

may also find application in the conceptual frameworks in developing or revising policies, such as knowledge management policies in crisis management. Policymakers may also find it useful to examine the effect of a diverse social library of frames in the composition of advisory committees, as well as the implementation or training in design thinking and process in crisis response.

As the OSSAC were tasked to write protocols which are future-oriented, in that they generate scenarios of what could happen, and then create plans on how to respond, the conceptual frameworks may also have application in other future-oriented exercises such as strategic planning.

Finally, while not explored in this research, how experts process information through sensemaking during a long duration crisis has applications in information systems design and further research is warranted in this topic.

Thoughts on the future

Since SARS, there was H1N1 in 2009 and Ebola (though not an emerging disease) in 2014- and ongoing. Our world is facing many complex issues and wicked problems, from climate change to global economic challenges. While there are many pulls on our attention, my hope is that we do not forget about preparing for the unknown. Even though emerging disease outbreaks are low probability, there is potential for catastrophic consequences and we need to continue efforts in research and planning.

Appendices

Appendix 3.1. Information sheet, page 1

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Expert Advisory Groups: Exploring the sensemaking process during a public health crisis response

INFORMATION SHEET FOR PARTICIPANTS

Thank you for your interest in this project. Please read this information before deciding whether or not to take part. If you decide to participate, thank you. If you decide not to take part, thank you for considering my request.

Who am I?

My name is Iva Seto and I am a Doctoral student in the School of Information Management at Victoria University of Wellington, in New Zealand.

What is the aim of the project?

To prepare for future crises, it is important to study the past. For this research, I will focus on the SARS crisis in Canada as a case study, and explore how an Expert Advisory Group (EAG) works to support Key Decision Makers (KDMs) in the crisis response. SARS in Canada is salient because of the magnitude of the unknowns – it was an emerging disease. Specifically, this research will explore the process of how the Ontario SARS Scientific Advisory Committee (OSSAC) develop and provide advice: how do they balance utilising information (or data) and experience in their advisory outputs, while facing immense pressure to act as quickly as possible to combat an unknown enemy.

This research has been approved by the Victoria University of Wellington Human Ethics Committee [24019].

How can you help?

If you agree to take part I will interview you online, at your office, or other preferred location. I will ask you questions about your experience as part of, or in relation to, the OSSAC during the SARS crisis. Questions will centre on processes: what were the processes in developing the work of the OSSAC; how did the team work together to develop and provide advice; how did they balance data (or lack of) and experience of experts, and also did the processes change over the 3-month period of SARS I and II? The interview will take one hour, and I may contact you at a later date to request a follow-up interview. I will record the interview. You can stop the interview at any time, or ask for the recorder to be turned off, without giving a reason. You can withdraw from the study by contacting me at any point within four weeks of the first interview. If you withdraw, the information you provided will be destroyed or returned to you.

Appendix 3.1. Information sheet, page 2

What will happen to the information you give?

This research is confidential. This means that the researchers named below will be aware of your identity. Your identity as a participant of this research will not be disclosed in any reports, presentations, or public documentation. However, you should be aware that as the participant pool is small (members of the OSSAC and relevant stakeholders), your identity might be clear to others in your community. Furthermore, if your name is included in a salient quote from a publicly available source (e.g. newspaper, SARS Commission), then it may be disclosed within the context of the quote in potential outputs of this research.

Only my supervisors and I will read the transcript of the interview. The interview transcripts, and recordings will be kept securely and destroyed *5* years after the research ends (thesis submission).

What will the project produce?

The information from my research will be used in my PhD thesis as well as articles submitted and potentially published in peer-reviewed journals, and presentations at conferences, seminars, etc.

If you accept this invitation, what are your rights as a research participant?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- choose not to answer any question;
- ask for the recorder to be turned off at any time during the interview;
- withdraw from the study within four weeks of the first interview;
- ask any questions about the study at any time;
- receive a transcript your interview by selecting this option in the consent form;
- agree on another name for me to use rather than your real name;
- receive a summary of key research findings near the completion of this project;
- Receive a copy of the PhD thesis by selecting this option in the consent form.

If you have any questions or problems, who can you contact?

If you have any questions, either now or in the future, please feel free to contact either:

Student:	**Supervisor:**
Name: Iva Seto School: School of Information Management Email address: iva.seto@vuw.ac.nz	Name: Dr. David Johnstone Role: Senior Lecturer School: School of Information Management Email address: David.Johnstone@vuw.ac.nz

Human Ethics Committee information

If you have any concerns about the ethical conduct of the research you may contact the Victoria University HEC Convener: Associate Professor Susan Corbett. Email susan.corbett@vuw.ac.nz or telephone +64-4-463 5480.

Appendix 3.2. Consent form

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Expert Advisory Groups: Exploring the sensemaking process during a public health crisis response

CONSENT TO INTERVIEW

This consent form will be held for *5* years after this research is finished (thesis submission), and will also pertain to subsequent interviews (if conducted).

Researcher: *Iva Seto, School of Information Management, Victoria University of Wellington.*

- I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.
- I agree to take part in audio recorded interview(s).

I understand that:

- I may withdraw from this study within four weeks of the first interview without giving any reason, and any information that I have provided will be returned to me or destroyed.
- The information I have provided will be destroyed *5* years after the thesis submission.
- Any information I provide will be kept confidential to the researcher and the supervisor. I understand that the results will be used for a PhD thesis and a summary of the results may be used in academic reports and/or presented at conferences.
- My name will not be used in reports, nor will any information that would identify me as provided in this research. However, if my name was included in a salient quote from a publicly available source (e.g. newspaper, SARS Commission), then my name may be included in the context of the quote in potential outputs of this research. Yes ☐ No ☐
- I would like a copy of the transcript of my interview: Yes ☐ No ☐
- I will receive a summary of key research findings near the completion of this project. Additionally, I would like to receive a copy of the PhD thesis and have added my email address below. Yes ☐ No ☐

Signature of participant: _____

Name of participant: _____

Date: _____ Email address: _____

Appendix 3.3

Memory aid page 1

The following are some materials to provide a snapshot of the SARS crisis, and the work of the OSSAC

This chart is from Low DE, McGeer A. SARS – One year later. *NEJM* 2003; 349(25):2381-82.

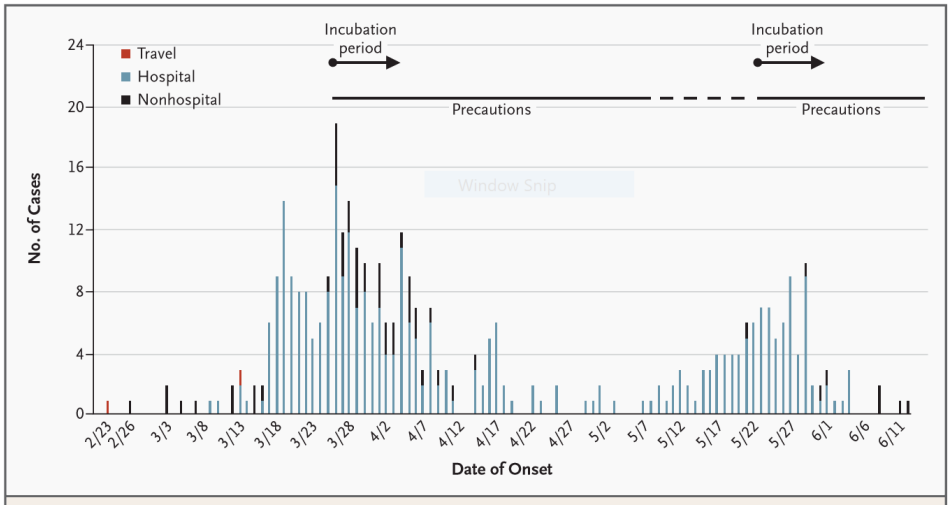


Figure. The Distribution of Cases in the Severe Acute Respiratory Syndrome (SARS) Outbreak in Ontario, Canada, from February 23 to June 12, 2003.

The epidemic consisted of two phases: phase 1 from February 23 to April 19 and phase 2 from April 21 to June 12. On March 26, SARS was declared a provincial emergency by the Ontario Ministry of Health and Long-Term Care. The ministry and health care providers took steps to contain the spread of SARS: isolating people who had been exposed, restricting hospital visits, and adopting new infection-control procedures at all levels of the health care system. Because no new cases were recognized during the two incubation periods after the last case had been diagnosed, barrier precautions were downgraded in hospitals between May 8 and May 23 (dashed line). On May 14, the World Health Organization removed Toronto from the list of areas with recent local transmission. Retrospectively, it is clear that throughout April and early May, nosocomial transmission to patients and visitors was occurring on a single ward in one hospital. Staff members were protected by precautions. Because of the absence of cases among staff members and of an epidemiologic link, SARS was ruled out in patients and visitors. On May 23, a cluster of cases at a rehabilitation hospital that had accepted patients from this ward was recognized as SARS, and hospitals in the greater Toronto area reinstituted the enhanced infection-control precautions adopted on March 26. Control of transmission was achieved promptly. The arrows represent the beginning and end of the incubation period for SARS after the institution of precautions in each phase of the outbreak.

Table highlighting events during the SARS crisis, and the work of the OSSAC

Date	SARS crisis	OSSAC
March 5, 2003	78 year old female who recently visited Hong Kong dies at home in Toronto*	
March 7, 2003	Son (index case) transported to hospital by paramedics*	

Memory aid page 2

March 13, 2003	Index case dies; 4 patients with febrile respiratory infection transported from community hospital to tertiary care centres*	
March 13 – 25, 2003	Further cases recognized to be similar to those in South-East Asia*	
March 25-26, 2003	Provincial emergency declared, Code Orange restrictions in place	Science group initiated*
March 27-30, 2003		Issues identified – hospital categories, PPE, screening*
March 31, 2003		6 members sent home for quarantine due to exposure on March 29.*
April 4, 2003		Priority for science group to identify how to identify the unknown cases (no known risk factors), incubation periods, case definition refinement, and linking epi data with lab data (from OSSAC minutes). OSSAC to develop four SARS scenarios and what health system must do - from massive epidemic, to eradication of the disease
April 9, 2003	BLD religious group – put into quarantine – approx. 500 people exposed.	
April 14, 2003		Directives released on hospital categories and guidelines
April 19, 2003	Entering the Easter weekend – great concern that there will be large gatherings of people with potential for transmission.	
April 22, 2003	CDC experts arrive in Toronto to do an 'external audit' – looking specifically at why HCW are still becoming ill, even after stringent measures	Experts meet – Ontario SARS, Public Health Measures meeting. Toronto Star, quoting Dr. Basrur on the purpose of the meeting: "[Dr. Basrur] described it as a brainstorming session where officials hope to hammer out a framework incorporating "best case, worst case, and maybe one or two in between .... But each scenario might be accompanied by control measures that are either generic, across the board and also that need to be tailored to the specific event.""

Appendix 3.3

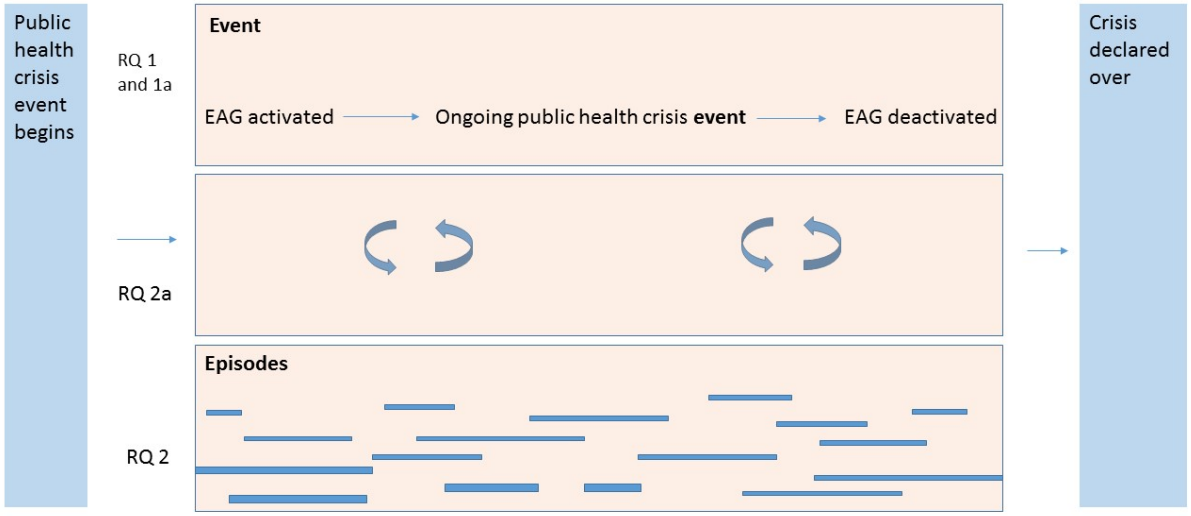
Memory aid page 3

April 23, 2003	WHO – travel advisory to Toronto in place	Discussing how to move forward from the public health measures meeting. Other issues discussed – public health decision guidelines, screening tools, Ontario case definition of SARS (from OSSAC minutes)
April 30, 2003	WHO – rescinded travel advisory	
May 1, 2003	Newspaper Ads – Toronto is safe!	
May 14, 2003	WHO – takes Toronto off list of places affected by SARS	
May 17, 2003	Provincial emergency status lifted	
May 24-25, 2003	SARS II onset: new suspected cases of SARS – index case is 96 year old man, considered to have post-operative pneumonia Concentrating treatment at four SARS hospitals	OSSAC regroups – daily teleconferences and weekly meetings*
May 29, 2003	Health Canada changes SARS case definition to align with WHO	
June 7, 2003	Medical resident fell ill on 12th day of exposure – leading to questions of incubation/ quarantine period.	Memo sent to hospitals regarding breaches of directives
June 11, 2003	Puzzling case – man in US falls ill with SARS – leading to questions of, can asymptomatic carriers spread SARS?	
June 14, 2003	Officials baffled by link between SARS I and II. Working theory of the link between SARS I and II – a nurse – later this is dropped.	Directives issued - hospitals must treat any patient who has fever, dry cough or another respiratory ailment as having SARS until the illness can be ruled out
June 18, 2003	WHO announces SARS has been stopped worldwide	Reviewing the case definition – diagnostic guidelines
July 2, 2003	WHO announces SARS has been contained in Toronto	OSSAC to continue assisting the government after the SARS crisis is over

*From the presentation by Brian Schwartz at the SARS commission public hearings. Oct 1, 2003.

Appendix 3.4

Temporal Map of episodes and the event



Originally in the research proposal (November 2016) each research question had a sub-question:

Research Question 1: During a public health crisis event, how do EAGs collectively engage in the process of providing advice to KDMs?

Research Question 1a: What is the role of information in the development of advice?

Research Question 2: To what extent does the EAG process of providing advice change over the duration of the public health crisis event?

Research Question 2a: How do sensemaking processes interrelate between the episodes and event duration?

Appendix 3.5

Grounded theory approach applied into the newspaper analysis

1.Initial Coding

First, all the articles in TGAM and TS were organised in 4-day units, then put chronologically down one side of a document in a column. All articles were analysed in 4-day units to better see emerging patterns over time. Coding was conducted for each newspaper separately.

2.Focussed Coding

For the newspapers, this was a 3-month iterative process; as I began analysing the data, I would list key ideas emerging from the pages as she went along. This would be done iteratively, with constant comparison; codes were organised and refined iteratively with data analysis. Concepts from sensemaking literature were utilized (deductive), as were codes emerging from the analysis (inductive), as provisional codes that were iteratively refined as an abductive approach. Thus, the code hierarchy was developed. Then, the newspaper data was coded in NVivo.

3.Theoretical coding

This stage was not completed; I extracted 4-5 codes from NVivo for analysis, and developed diagrams that depicted the social evolution of frames among the national/ international scientific community (see ISCRAM paper).

Appendix 3.6

Focused codes development for interview data

Stage	Focussed Coding development
1	Reviewing initial coding in each transcript, and adding frequent or important codes to a list of provisional codes for Focussed coding. Codes are deemed to be important if they directly relate to, or provide insight to, the research question. Apriori sensemaking codes are included. As I go along, I also review the provisional codes and refine them. Memos are also revisited, as are the focussed codes developed during the newspaper focussed coding stage of this research study.
2	The provisional codes are reviewed and compared with all transcripts to ensure all the salient data is coded. This is dynamic process of ensuring the data is reflected in the codes, as well as that the codes are appropriate and fit the data well. Codes are refined concurrently, and new codes may also emerge at this stage, albeit rarely. These provisional codes are discussed with the supervisory team (September 5, 2018), and I am given approval to begin NVivo coding all transcripts.
3	Focussed codes are input to NVivo, and all transcripts are coded accordingly. See Appendix 3.6 below for the Focussed codes. The number preceding the code indicates which research question the code belongs to.

Appendix 3.7

Focused codes developed for interview data, and used for coding the transcripts in NVivo

Name
1-directives
1-measures
1-retrospective SM
1-scenarios
1a- being an expert (individual)
1a-external acquisition
books, school, professional development, training
personal experience of outbreaks
1a-innate ability
Gut feeling
handling emergencies or crisis on a personal level
2- acute sensemaking cases
Easter weekend
GO train nurse
HCW cases after difficult intubation
OSSAC member ill with SARS; members quarantined
SARS II beginning
WHO travel advisory
2- building and evolving processes for directives

Name
balancing science and practice
Cumulative frames in social library
anticipation
sensitivity to weak cues
tethered frames
iterative nature of directives
task triage - anchoring and desktop concept
updating and revising
2- OSSAC identity
characteristics of OSSAC - team learning
ad hoc and reactive, adapting in real-time
bringing people together who don't usually work together
changing role from SARS I to SARS II
how they functioned on a daily basis
professional boundaries and identities (team relations)
2- public health crisis
control - the need for directives
crisis context
decision making and information issues
Normalcy bias and commitment to frames
pressure, stress, urgency, uncertainty

Name
emerging disease context
precautionary principle
unknowns - disease related

Appendix 3.8

Detailed description of RQ1 process sequential analysis

The approach to analysis is isolating the process data from each individual participant and isolating their remarks and thoughts of the sequence of developing directives. This way, the data is reduced per individual, and when the data are integrated, it is clearer to see if there's any missing sequential gap per person, or who gave a certain piece of data, more clearly. This method was also chosen as it would be helpful in the third round of data collection to see what are the gaps for further probing.

1. Isolate process data per participant
    a. Extract from raw data, and put each individual participant in one Word file (of the 15 participants, 10 yielded data that could be analysed for directives analysis, and 13 for the RSM analysis for RQ1).
    b. Create tracking in the excel sheet
2. Reduce to sequential steps
    a. Sequence (RQ1) and concept data (RQ2) are intertwined, so as I go through and extract sequence data (for example, from the directives node), I have two tables and as I dis-entangle the data, I put the sequence data in one

table and concept data in the other. Add in the table – notes, coding of what is happening during that particular process or bounded concept.

b. Each of the participants specify a sequence of how they worked to develop advice – this is sequenced within each unit (participant data), as FIRST, SECOND, etc
c. Each of those sequences was coded.
d. Codes were then further abstracted and grouped into parent codes – for the directives analysis, it was four parent codes – "bracketing", "interpretation", "iterations", and "plausibility"; for the RSM analysis, the parent codes were "trigger", "bracketing", "meaning creation", "plausibility for RSM", "transition to prospective" and "evolution of frames"

3. Compare/ integrate all data for RQ1.
    a. Data were extracted and saved in separate files per parent code so all data of that specific code are grouped together to analyse that specific step in the sequence.
    b. look for commonalities within the sequence to characterise it.
    c. Map out the sequential process to derive CONCEPTUAL FRAMEWORK.

Appendix 3.9 Feedback and Evaluation Interviews Data (FEID) analysis

stage	description
Immersion	Immersion in the data within each code, notes created in comment boxes.
initial coding	The data is placed in a table, in the left column. Initial coding is done quickly with action words and gerunds. Where possible, I add a comment for which RQ it is most relevant to.

focussed coding.	The codes for RQ1 and RQ2 are placed in a table to review the FEID side-by-side, through comparison. This is to ensure all salient data is covered by a code, and if not, that **it may represent** an emergent code. The relevant data is "coded" by copying and pasting the salient portion into the document that represents the code (RQ1, or RQ2 codes).
Theoretical coding (just like in first two clusters)	**Immersion and "TIC"** – quick codes again, immersion **TFC** – copying and pasting key data into top of document, and organising by concepts **Characterisation** – deleting data tables; abstracting the data at the top of document to key concepts
Integration	This is constant comparison between the TFC and the concept map – I found this so helpful in organising the TFC (even FEID had a lot of data, and could be overwhelming) and keeping in mind the 'big picture' as I organised the details (or within each code), particularly in the 'Updating' code which is very substantial. Going through each relationship and box in the concept map – does it resonate with what is in the TFC document – and reshaping it if not. This is a process – not everything is changed/revised in one sitting. It is dynamic – an immersion in one, then an immersion in the other – then changing/reshaping one or two things as they come to my awareness, in the concept map. Doing it mindfully, and within the same sitting helps a lot to keep it in the forefront of the mind. 1 Do constant comparision within codes – and clean inside document – and with concept map.

	2 do constant comparison between FEID and main cluster of analysis – clean up, make sure there is uniform analysis between the two A . Create a separate "Integration folder" B. immerse main analysis, memo C. immerse FEID, memo D. 'integrate' by putting together in one document (per code) and being clear about what aspects have saturation to be reported. E. document these decisions F. review concept map for each code G. do this for RQ1 and RQ2

Appendix 4.1

RSM sequence analysis Example 1

Raw data	Sequence Analysis
"So you look at what is this disease behaving like, what does it look like, what can it be. We've ruled, this, this and this out, so that takes you – that's done quickly. So you're not in completely uncharted territory. You're trying to use parallels and your past experience, and your past knowledge, of things.	1. Interpretation (matching cues to possible frames)
In public health and in epidemiological work, you always look for exceptions – so the outlier cases and those are the ones that are most instructive in telling you things. So the person who doesn't fit the pattern but suddenly becomes ill. Well there's something about their exposure that will tell you, maybe start to give you a clue as to the incubation period, because maybe they were…. And I can't recall any details here – but maybe they just visited the hospital one day and became sick, and that's where you start to get your clues."(Dr. Murasami)	1. Trigger 2. Interpretation

*Table note – each row represents one sensemaking stream. Each table represents one participant's voice.

In Example 1 above, there is one stage (Interpretation) in the first row, then in the second row, there was data to show two stages, in a sequence. In Example 2 below, a participant provides data on another stage – Bracketing.

RSM sequence analysis Example 2

Raw data	Sequence Analysis
So then you think ok, because it is so rare for Canada to be dealing with, well outside of Guangdong province in China, really we were the	

only country that had identified it in transmission. So with all of that, well what do we know about how this disease progresses, what's the duration of symptoms, **when does a patient deteriorate** <u>because we saw from time of onset of symptoms, a person would sometimes appear to be recovering, like a common cold, then there would be a sudden deterioration with acute respiratory distress.</u> … So the initial precautions were based a lot on an influenza model, with masks, gowns, gloves, hand hygiene. (Ms. Shields)	1. Trigger (underlined) leading to: 2. bracketing (bolded). The participant verbalised the sequence backwards

Appendix 4.2

PSM sequence analysis – Example 1

Raw data	Sequence Analysis
you have to lean on what you know about other things and other transmissions. So if you have – a respiratory organism and you're not sure about the mask or what we're doing is working, you go to another level up. The N95 should work for everybody. So you think – this is what we know about the organisms out there, and this is kind of what the organism is behaving like *so this is the mask, or this is the PPE or this is the stuff we recommend for all of those things*. And so you start from there. What do you think it looks like, is behaving. [PPE = Personal Protective Equipment]	(1a) RSM – matching cues to frames (this is what we see, and it looks like this other disease that we have response protocols for) [underlined] (1b) PSM – Bracketing (tethered to RSM) – marshalling resources [underlined, italics]
Then these are all of the pieces of equipment or things that you would normally do and do all of that. Do all of that. And then it's a bit of like, wait and see and hold your breath, and hope no transmission is occurring. And sometimes you – and then you say if you're going to do something where for whatever reason you generate more spit, then you do more – you have the full-on suit.	(2b) PSM – Enaction to implementation (exit the OSSAC) [italics] (3) RSM – Plausibility – waiting to see if there are new cases to prove/disprove provisional sensemaking [underlined]
So it's really just working through, all of the different potential scenarios, all these things that you currently know and do." [Ms. Humphries]	(2a) PSM – Interpretation – generating scenarios, based on known frames

Note – the narrative flows between the rows and is from one participant. The rows are imposed to help organise the data.

In PSM Sequence Analysis - Example 1 above, in the initial analysis I could not place the data within a sequence as the participant discusses aspects of the full RSM-PSM cycle; but, through iterative analysis of all the data, as described in the methodology chapter, I could fit the pieces together.

PSM sequence analysis – Example 2

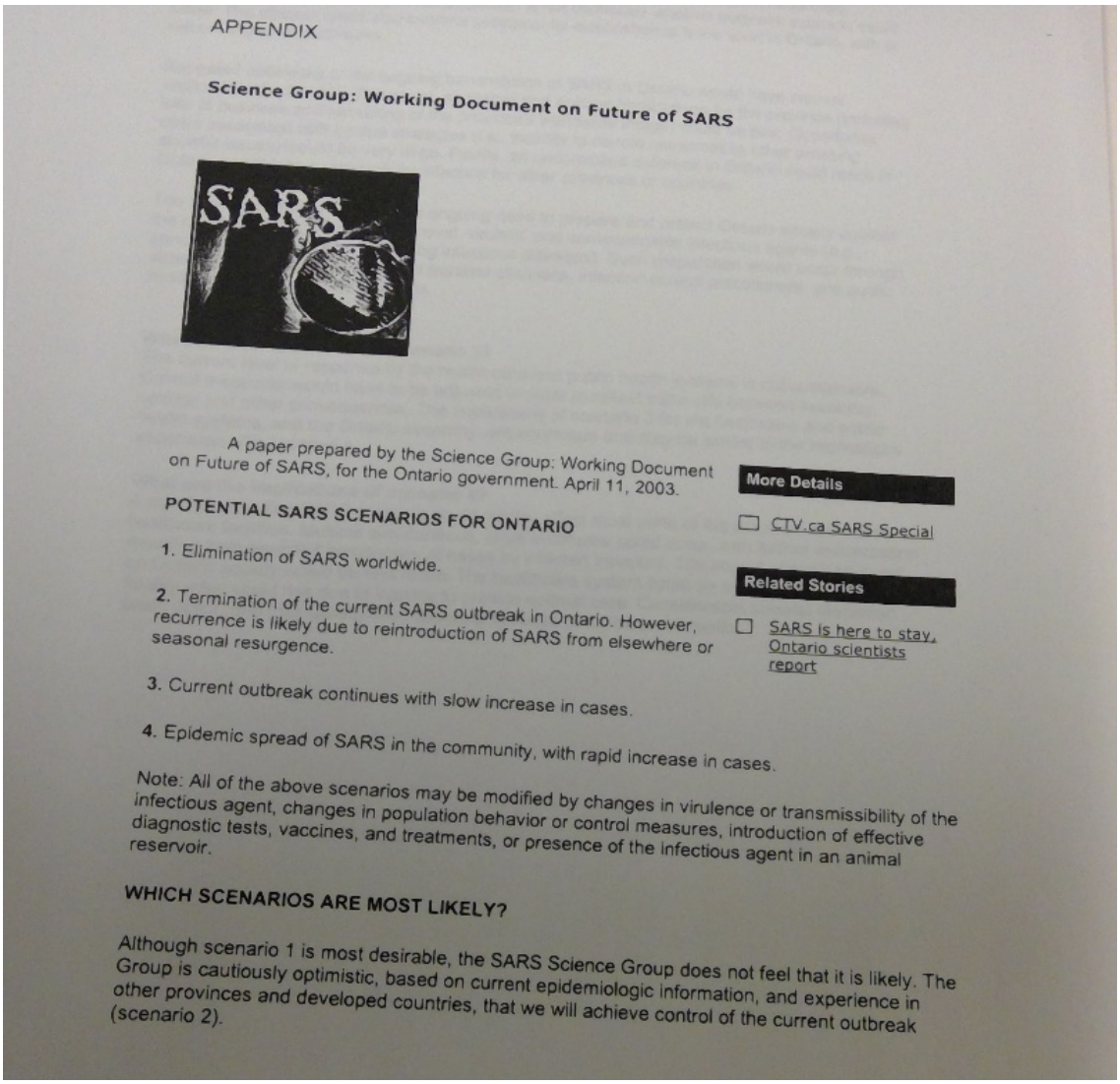
Raw data	Sequence analysis
[asked participant for an example for how a protocol is developed] So let's say that I've suddenly identified that two babies in my neonatal intensive care unit **have an infection due to what looks like the same strain of** [unclear]. I don't know where it came from, I don't know whether there are more babies, there's a whole list of things I don't know when I start the outbreak. But those outbreak responses are patterned. <u>I make a list of things I don't know, and how to get them and prioritize them.</u> Then I'm going to impose a bunch of measures that are about, ok*, let's look at what the possibilities are within the realm of things I don't know.* ….	(4) Trigger (RSM) [bold] (2) RSM meaning creation [underlined] (3) PSM meaning creation: interpretation: generating scenarios [italics]
So there's only four ways that bacteria are transmitted from one person to the next. So I start on those four ways. If I need to interrupt transmission, given what I've seen so far, what do I think the probability of different transmission routes is, what do I need to do depending on those transmission routes, how important might various things be, what could go wrong if I miss something. It's epidemiology and infectious diseases – it's about knowing how things get transmitted, and how people get sick, and just trying to think your way through the circumstances. [Dr. Borjes]	(3) PSM meaning creation: interpretation: generating scenarios [entire cell]

Appendix 4.3

OSSAC developed scenarios for how outbreak may unfold.

Retrieved from Province of Ontario Archives (June 2017).

page 1



APPENDIX

Science Group: Working Document on Future of SARS

A paper prepared by the Science Group: Working Document on Future of SARS, for the Ontario government. April 11, 2003.

POTENTIAL SARS SCENARIOS FOR ONTARIO

1. Elimination of SARS worldwide.

2. Termination of the current SARS outbreak in Ontario. However, recurrence is likely due to reintroduction of SARS from elsewhere or seasonal resurgence.

3. Current outbreak continues with slow increase in cases.

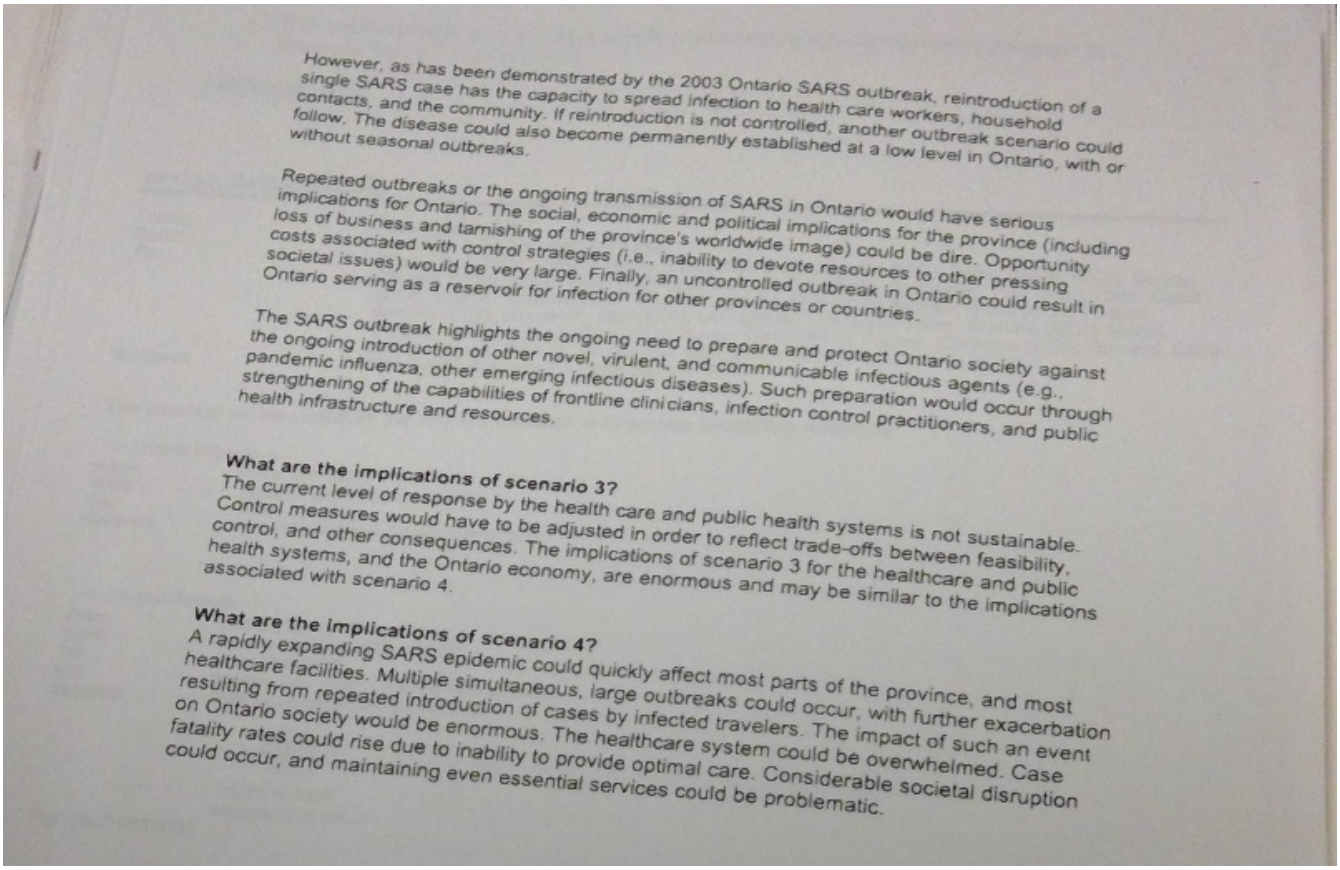
4. Epidemic spread of SARS in the community, with rapid increase in cases.

Note: All of the above scenarios may be modified by changes in virulence or transmissibility of the infectious agent, changes in population behavior or control measures, introduction of effective diagnostic tests, vaccines, and treatments, or presence of the infectious agent in an animal reservoir.

WHICH SCENARIOS ARE MOST LIKELY?

Although scenario 1 is most desirable, the SARS Science Group does not feel that it is likely. The Group is cautiously optimistic, based on current epidemiologic information, and experience in other provinces and developed countries, that we will achieve control of the current outbreak (scenario 2).

Appendix 4.3, page 2.



However, as has been demonstrated by the 2003 Ontario SARS outbreak, reintroduction of a single SARS case has the capacity to spread infection to health care workers, household contacts, and the community. If reintroduction is not controlled, another outbreak scenario could follow. The disease could also become permanently established at a low level in Ontario, with or without seasonal outbreaks.

Repeated outbreaks or the ongoing transmission of SARS in Ontario would have serious implications for Ontario. The social, economic and political implications for the province (including loss of business and tarnishing of the province's worldwide image) could be dire. Opportunity costs associated with control strategies (i.e., inability to devote resources to other pressing societal issues) would be very large. Finally, an uncontrolled outbreak in Ontario could result in Ontario serving as a reservoir for infection for other provinces or countries.

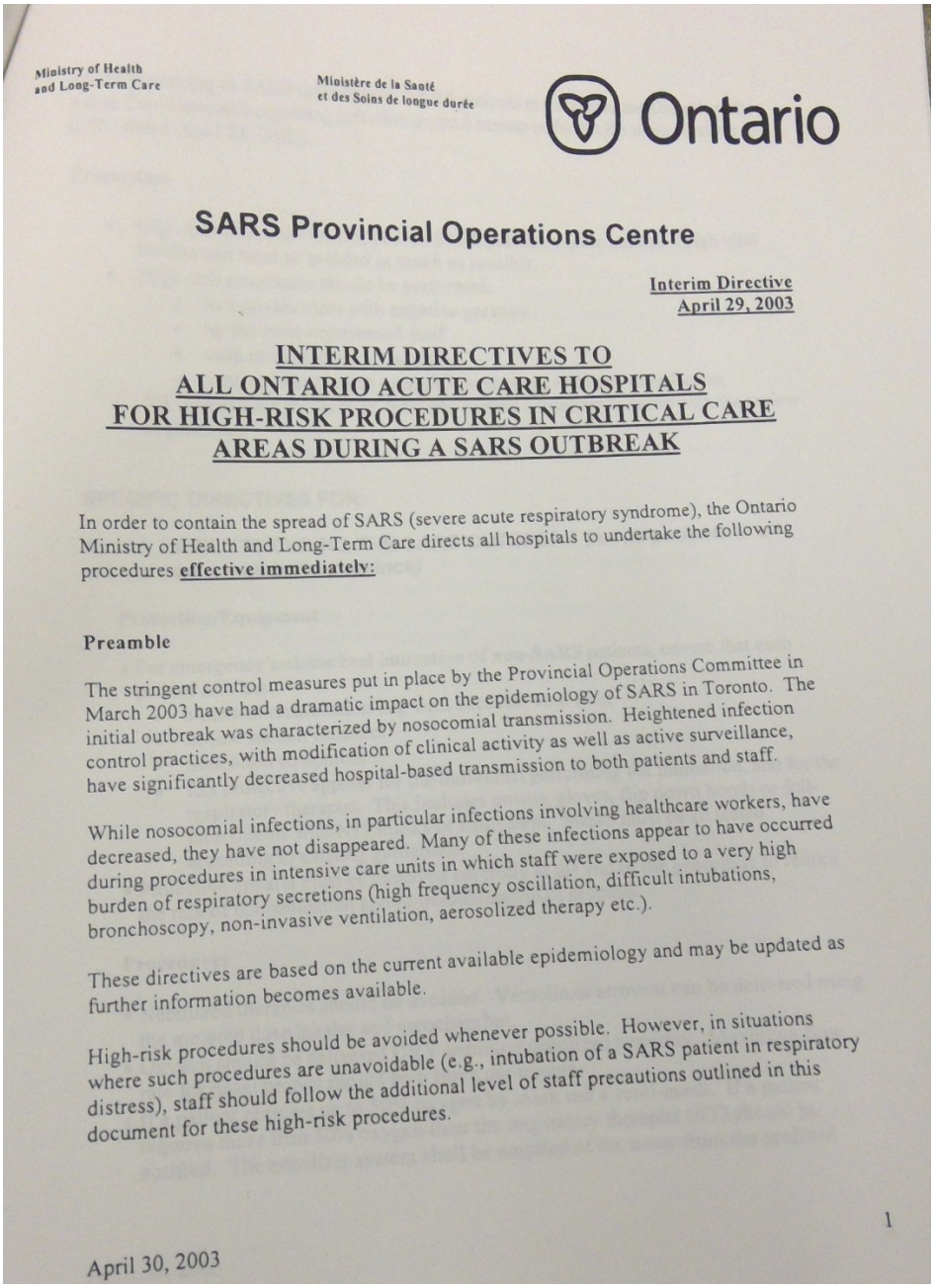
The SARS outbreak highlights the ongoing need to prepare and protect Ontario society against the ongoing introduction of other novel, virulent, and communicable infectious agents (e.g., pandemic influenza, other emerging infectious diseases). Such preparation would occur through strengthening of the capabilities of frontline clinicians, infection control practitioners, and public health infrastructure and resources.

What are the implications of scenario 3?
The current level of response by the health care and public health systems is not sustainable. Control measures would have to be adjusted in order to reflect trade-offs between feasibility, control, and other consequences. The implications of scenario 3 for the healthcare and public health systems, and the Ontario economy, are enormous and may be similar to the implications associated with scenario 4.

What are the implications of scenario 4?
A rapidly expanding SARS epidemic could quickly affect most parts of the province, and most healthcare facilities. Multiple simultaneous, large outbreaks could occur, with further exacerbation resulting from repeated introduction of cases by infected travelers. The impact of such an event on Ontario society would be enormous. The healthcare system could be overwhelmed. Case fatality rates could rise due to inability to provide optimal care. Considerable societal disruption could occur, and maintaining even essential services could be problematic.

Appendix 4.4 “Interim Directives to all Ontario acute care hospitals for high-risk procedures in crucial care areas during a SARS outbreak” - dated April 29, 2003

Page 1



Ministry of Health and Long-Term Care

Ministère de la Santé et des Soins de longue durée

Ontario

SARS Provincial Operations Centre

Interim Directive
April 29, 2003

INTERIM DIRECTIVES TO ALL ONTARIO ACUTE CARE HOSPITALS FOR HIGH-RISK PROCEDURES IN CRITICAL CARE AREAS DURING A SARS OUTBREAK

In order to contain the spread of SARS (severe acute respiratory syndrome), the Ontario Ministry of Health and Long-Term Care directs all hospitals to undertake the following procedures **effective immediately:**

Preamble

The stringent control measures put in place by the Provincial Operations Committee in March 2003 have had a dramatic impact on the epidemiology of SARS in Toronto. The initial outbreak was characterized by nosocomial transmission. Heightened infection control practices, with modification of clinical activity as well as active surveillance, have significantly decreased hospital-based transmission to both patients and staff.

While nosocomial infections, in particular infections involving healthcare workers, have decreased, they have not disappeared. Many of these infections appear to have occurred during procedures in intensive care units in which staff were exposed to a very high burden of respiratory secretions (high frequency oscillation, difficult intubations, bronchoscopy, non-invasive ventilation, aerosolized therapy etc.).

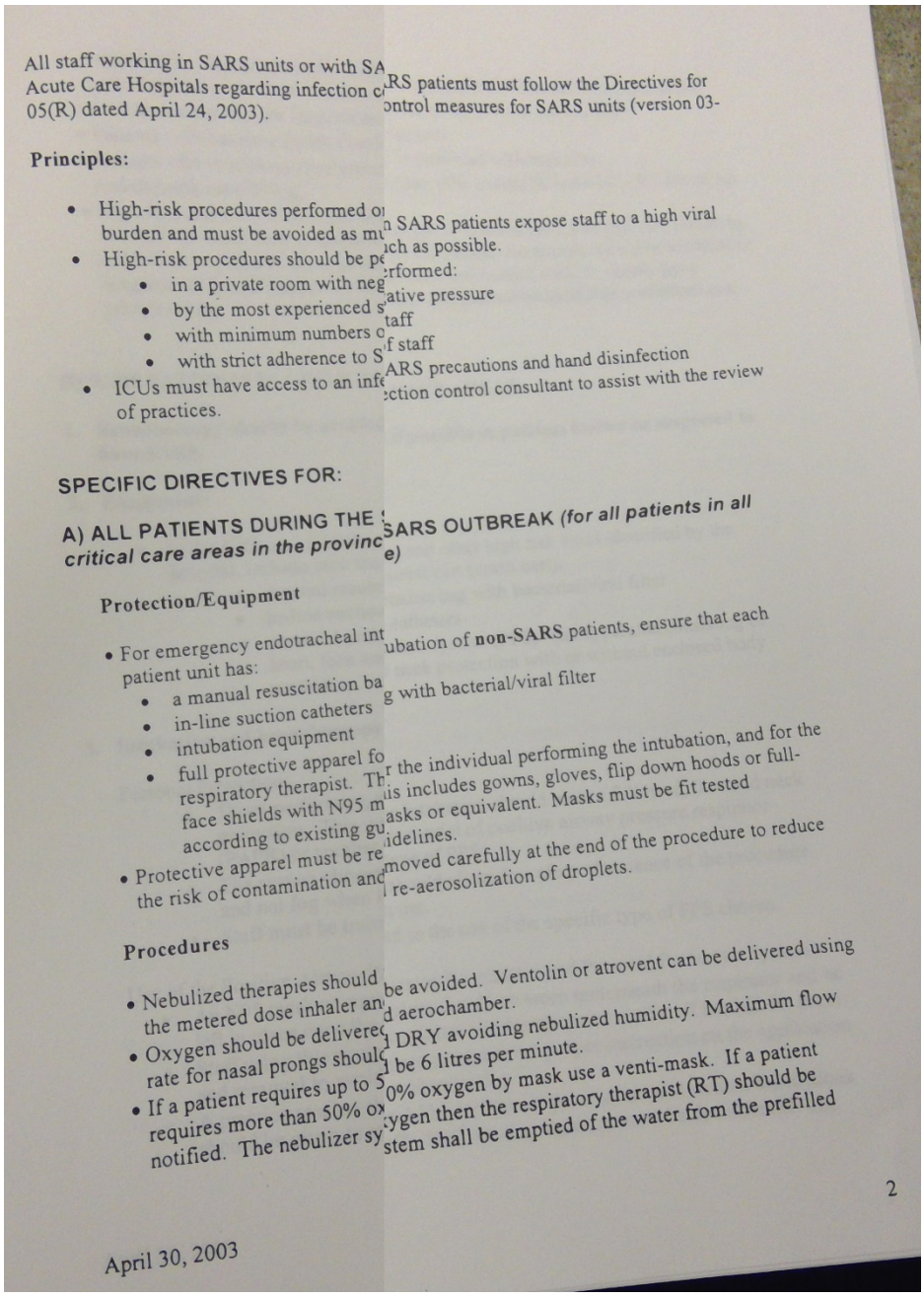
These directives are based on the current available epidemiology and may be updated as further information becomes available.

High-risk procedures should be avoided whenever possible. However, in situations where such procedures are unavoidable (e.g., intubation of a SARS patient in respiratory distress), staff should follow the additional level of staff precautions outlined in this document for these high-risk procedures.

1

April 30, 2003

Appendix 4.4, Page 2



All staff working in SARS units or with SA
Acute Care Hospitals regarding infection c
05(R) dated April 24, 2003).

RS patients must follow the Directives for
ontrol measures for SARS units (version 03-

Principles:

- High-risk procedures performed o
  burden and must be avoided as m
- High-risk procedures should be pe
  - in a private room with neg
  - by the most experienced s
  - with minimum numbers o
  - with strict adherence to S
- ICUs must have access to an infe
  of practices.

n SARS patients expose staff to a high viral
ich as possible.
rformed:
ative pressure
taff
f staff
ARS precautions and hand disinfection
ction control consultant to assist with the review

SPECIFIC DIRECTIVES FOR:

A) ALL PATIENTS DURING THE
critical care areas in the provinc

SARS OUTBREAK *(for all patients in all*
e)

Protection/Equipment

- For emergency endotracheal int
  patient unit has:
  - a manual resuscitation ba
  - in-line suction catheters
  - intubation equipment
  - full protective apparel fo
    respiratory therapist. Th
    face shields with N95 m
    according to existing gu
- Protective apparel must be re
  the risk of contamination and

ubation of **non-SARS** patients, ensure that each

g with bacterial/viral filter

r the individual performing the intubation, and for the
is includes gowns, gloves, flip down hoods or full-
asks or equivalent. Masks must be fit tested
idelines.
moved carefully at the end of the procedure to reduce
l re-aerosolization of droplets.

Procedures

- Nebulized therapies should
  the metered dose inhaler an
- Oxygen should be delivere
  rate for nasal prongs shoul
- If a patient requires up to 5
  requires more than 50% ox
  notified. The nebulizer sy

be avoided. Ventolin or atrovent can be delivered using
d aerochamber.
l DRY avoiding nebulized humidity. Maximum flow
l be 6 litres per minute.
0% oxygen by mask use a venti-mask. If a patient
ygen then the respiratory therapist (RT) should be
stem shall be emptied of the water from the prefilled

2

April 30, 2003

water bottle. The water bottle should remain DRY. The RT will monitor the patient and wean to nasal prongs as soon as the patient can tolerate.

- Patients should receive frequent mouth care.
- Patients with tracheostomies should be provided with humidity.
- Patients who require oxygen greater than 50% should be referred to RT for set up and ongoing monitoring.
- High frequency oscillation and non-invasive ventilation (CPAP/BiPAP) should be avoided. If ventilation is essential for the patient, the patient should be screened in consultation with infectious diseases/infection control staff, to ensure that a diagnosis of SARS has been ruled out. The procedure should be performed in a private room.

B) SARS PATIENTS IN CRITICAL CARE AREAS

1. **Bronchoscopy should be avoided if possible in patients known or suspected to have SARS.**

2. **Equipment:**

   - In the ICUs and SARS units and other high risk areas identified by the hospital, include with the arrest cart (crash cart):
     - manual resuscitation bag with bacterial/viral filter
     - in-line suction catheters
     - personal protection system (PPS) – an apparatus consisting of head, face and neck protection with or without enclosed body protection

3. **Intubation and bronchoscopy:**

Personal Protection:

- Those performing the intubation should wear a full head, face and neck protection. This may consist of positive airway pressure respirator (PAPR) or another type of PPS.
- The system chosen should allow for safe performance of the procedure and not fog when in use.
- Staff must be trained in the use of the specific type of PPS chosen.

Use of the Positive Airway Pressure Respirators and Personal Protection Systems:

- An N95 mask or equivalent should be worn underneath the respirator and be left in place once the respirator hood is removed until staff has left the room.
- Staff using this equipment must receive proper instruction on the application and removal to avoid contamination.
- A practice session should be carried out prior to use and written instructions should be given to staff. Staff training sessions must be documented. The

hospital Infection Control Practitioner must review the written procedure/ instructions.

- Ensure that all disposable components of the equipment are carefully removed at the end of the procedure and reusable items are thoroughly cleaned using hospital disinfectant or disinfectant wipes.
- The application and removal of PAPR/PPS equipment requires the assistance of another person and should not be done alone.

Personnel:

- The procedure should be performed by the most experienced staff members available. The number of persons in the room should be kept to a maximum of 2-3 persons (note: hospitals may wish to consider a SARS intubation team).

Procedure:

- The procedure should be done in a negative pressure room. If none are available, it must be done in a private room with the door closed.
- After hand-washing and prior to entering the room, the code team will apply the personal protective equipment as per directive 03-05 (April 23, 2003) and manufacturer's instructions
- Staff performing the intubation will apply the personal protection system (PPS)
- The intubation should be done while the patient is sedated and paralysed if medical condition permits.
- The ventilator and in-line suction device should be in the patient room to reduce time needed for bag ventilation and disconnecting bag from the endotracheal tube suctioning.
- Remove protective equipment following directive 03-05 (April 23, 2003) and manufacturer's instructions after intubation.
- Minimize re-entry to the room by staff for approximately 2 hours post procedure.

Cleaning:

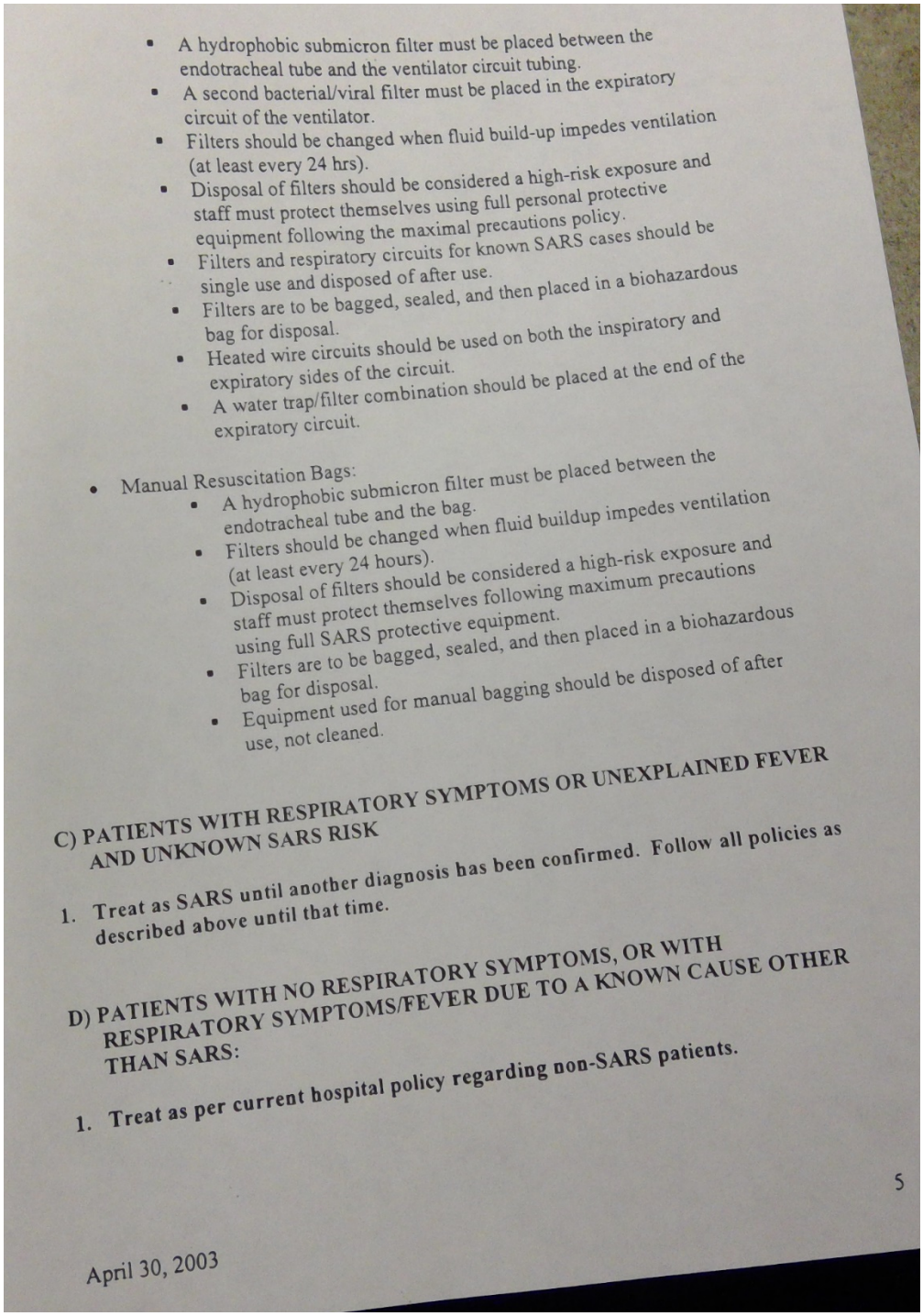
- Excess medications should be discarded at the end of the procedure.
- Immediate clean up of room and equipment should be done slowly and in such a way as to reduce the re-release of aerosols.
- Potentially contaminated surfaces in the room should be wiped with a hospital-approved disinfectant.

4. Management of SARS patients with mechanical ventilation:

Note: Infectious respiratory secretions from SARS patients will contaminate respiratory equipment and be expelled into the surrounding environment.

Procedure:

- Ventilators



- A hydrophobic submicron filter must be placed between the endotracheal tube and the ventilator circuit tubing.
- A second bacterial/viral filter must be placed in the expiratory circuit of the ventilator.
- Filters should be changed when fluid build-up impedes ventilation (at least every 24 hrs).
- Disposal of filters should be considered a high-risk exposure and staff must protect themselves using full personal protective equipment following the maximal precautions policy.
- Filters and respiratory circuits for known SARS cases should be single use and disposed of after use.
- Filters are to be bagged, sealed, and then placed in a biohazardous bag for disposal.
- Heated wire circuits should be used on both the inspiratory and expiratory sides of the circuit.
- A water trap/filter combination should be placed at the end of the expiratory circuit.

- Manual Resuscitation Bags:
  - A hydrophobic submicron filter must be placed between the endotracheal tube and the bag.
  - Filters should be changed when fluid buildup impedes ventilation (at least every 24 hours).
  - Disposal of filters should be considered a high-risk exposure and staff must protect themselves following maximum precautions using full SARS protective equipment.
  - Filters are to be bagged, sealed, and then placed in a biohazardous bag for disposal.
  - Equipment used for manual bagging should be disposed of after use, not cleaned.

C) PATIENTS WITH RESPIRATORY SYMPTOMS OR UNEXPLAINED FEVER AND UNKNOWN SARS RISK

1. **Treat as SARS until another diagnosis has been confirmed. Follow all policies as described above until that time.**

D) PATIENTS WITH NO RESPIRATORY SYMPTOMS, OR WITH RESPIRATORY SYMPTOMS/FEVER DUE TO A KNOWN CAUSE OTHER THAN SARS:

1. **Treat as per current hospital policy regarding non-SARS patients.**

5

April 30, 2003

Appendix 5.1. SARS POC letter on the "New Normal"

Ministry of Health
and Long-Term Care

Ministère de la Santé
et des Soins de longue durée

Ontario

SARS Provincial Operations Centre

May 13, 2003

As Ontario moves to lift the SARS provincial emergency, health care organizations and workers must prepare for entering a new phase of practice – a phase that has been named the "new normal".

The new normal will be characterized by high standards of practice that reflect a heightened awareness of emerging infectious diseases including SARS. Goals of practice are the prevention of exposure, early detection of new cases with appropriate management, protection of others in the community and health care setting, and full and appropriate management of those individuals with other health care needs.

At this time there remains a high probability of sporadic re-introduction of SARS resulting in local cases with the potential for transmission, particularly from recent travelers. Health care providers and facilities must continue to maintain a very high vigilance for communicable diseases (including SARS) and work together to ensure that the health care system can respond effectively.

New directives have been developed to assist facilities and health care practitioners to begin to practice in the "new normal". **These directives take effect as of 0800 hours Friday May 16, 2003.**

The directives for the acute care sector are transitional in nature and maintain the facility categorization system. This reflects the evolving understanding of acute care treatment of the disease. The directives for community health care providers and agencies, CCACs, paramedics and ambulance communication services, and non-acute facilities outline precautions to be invoked routinely as well as measures to be invoked in the event of another outbreak. Where appropriate, these directives also outline practices to be used in the transition period.

All practitioners and healthcare workers can expect ongoing communication from the Ontario government as new information on the identification and treatment of this and other communicable diseases becomes available.

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