

To Report or Not to Report: Factors That Influence Physician Error Reporting Behaviour

by

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Abstract

A significant amount of evidence affirms that medical errors increase the risk of injury and death. In an ideal health care environment, physicians and health care organizations would accurately report all medical errors to mitigate reoccurrences and increase patient safety. However, the true incidence of physician error is largely unknown, in part, due to underreporting. This under-reporting results in a lack of important data, which may help us understand and correct error contributors and system design failures. In addition, these errors also pose a significant financial burden on hospital expenses and the healthcare system as a whole. The purpose of this major paper is to identify and describe, the types of physician error and their causes, the reporting mechanisms of error, and the predominant factors which can affect physician error reporting behaviour. The "Theory of Planned Behaviour" is used as a means of identifying and illustrating how certain factors can influence error reporting behaviour. Each factor associated with physician error reporting is explained in relation the theory's constructs. The literature search was conducted electronically using the Laurentian University Library to access various journals and platforms. The predominant factors that influence reporting are: that reporting system and process, psychological safety, manager and supervisor support, feedback for patient safety improvement, teamwork and peer support, as well as lack of time. By addressing the barriers and enablers of physician error reporting, patient safety would increase. We can ensure the same errors do not occur again by addressing the predominant factors that affect reporting. Despite efforts to increase reporting, further research and implementation of practices are needed to reduce the barriers that influence physician error reporting and increase the enablers.

Keywords: physician error, medical error, error reporting, error reporting behavior, causes of error, error reporting systems, the theory of planned behavior, error reporting in aviation, patient safety, medical error, error reporting policy Canada, error reporting factors.

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Table of Contents

ABSTRACT	I
ACKNOWLEDGMENTS	II
TABLE OF CONTENTS	III
LIST OF FIGURES, TABLES AND APPENDICES.....	V
INTRODUCTION.....	1
SITUATING THE RESEARCHER.....	10
RESEARCH QUESTIONS.....	11
APPROACH	12
THEORETICAL FRAMEWORK	12
<i>Attitude Toward the Behaviour</i>	14
<i>Subjective Norms</i>	15
<i>Perceived Behaviour Control</i>	15
LITERATURE SEARCH STRATEGY	16
PHYSICIAN ERROR.....	18
TYPES OF ERROR	18
<i>Diagnostic Errors:</i>	18
<i>Treatment Errors:</i>	20
CAUSES OF ERROR:.....	22
REPORTING PROCESS IN CANADA.....	27
AVIATION PRACTICES AND HEALTHCARE.....	27
PHYSICIAN ERROR REPORTING.....	31
<i>Types of reporting systems:</i>	33
POLICIES AND LEGISLATION RELATED TO REPORTING ERRORS AND ADVERSE EVENTS:.....	36
<i>Saskatchewan Legislation and Regulations:</i>	37
<i>Manitoba Legislation and Regulations:</i>	38
<i>Ontario Legislation and Regulations:</i>	38
<i>Québec Legislation and Regulations:</i>	39
PHYSICIAN'S RESPONSIBILITY TO REPORT.....	40
FACTORS THAT INFLUENCE PHYSICIAN ERROR BEHAVIOUR	45
REPORTING SYSTEM AND PROCESS	46
<i>Attitude Toward the Behaviour – Reporting Systems and Process</i>	46
<i>Subjective Norm – Reporting Systems and Process</i>	48
<i>Perceived Behavioural Control – Reporting Systems and Process</i>	48
PSYCHOLOGICAL SAFETY	50
<i>Attitude Toward the Behaviour – Psychological Safety</i>	52
<i>Subjective Norm – Psychological Safety</i>	55
MANAGER AND SUPERVISOR SUPPORT	56
<i>Attitude Toward the Behaviour - Manager and Supervisor Support</i>	57
<i>Subjective Norm - Manager and Supervisor Support</i>	58
FEEDBACK FOR PATIENT SAFETY IMPROVEMENT.....	59
<i>Attitude Toward the Behaviour – Feedback for Patient Safety Improvement</i>	60
TEAMWORK AND PEER SUPPORT	61
<i>Attitude Toward the Behaviour - Teamwork and Peer Support</i>	62
<i>Subjective Norm - Teamwork and Peer Support</i>	64
LACK OF TIME	66
<i>Attitude Toward the Behaviour - Lack of Time</i>	67
<i>Perceived Behavioural Control - Lack of Time</i>	67
DISCUSSION.....	69
INTERPRETATIONS	70

EFFECTIVENESS OF THE TPB	72
LIMITATIONS	74
RECOMMENDATIONS FOR FUTURE RESEARCH	75
RECOMMENDATIONS FOR FUTURE PRACTICE.....	76
CONCLUSION	80
REFERENCES	81
APPENDICES	97

List of Figures, Tables and Appendices

Figures

Figure 1: The Costs of Medical Error (Kohn et al., 1999)

Figure 2: Theory of Planned Behaviour Model (Ajzen, 1985)

Figure 3: Summary of the Types of Medication Errors from Miller et al. (2010)

Figure 4: Summary of physician-related causes of medical error (Bari et al.2016; Hall et al., 2016; Sheikhtaheri et al., 2018)

Figure 5: Error reporting form – Important data summary (Health Quality Ontario, 2017)

Figure 6: Summary of the Commitments from the CMA Code of Ethics (CMA, 2018)

Tables

Table 1: Cognitive Biases which Influence Physician Diagnosis (Bordini, Stephany, & Kliegman, 2017)

Table 2: Distinctive features of aviation and healthcare (From Kapur et al., 2015, p. 2)

Table 3: Average Weekly Hours of General Physicians in Canada (CMA, 2019c)

Table 4: Factors Associated to Error Reporting and the TPB

Appendices

Appendix A: Aviation occurrent reporting form (TSB, 2019)

Appendix B: Saskatchewan Critical Incident Reporting Guideline (2004)

Appendix C: References Citing Types of Fears

Introduction

Patients expect clinical care to be safe, and for many people, it is. Unfortunately, some patients face unintended harm as a result of the care they receive (CPSI, 2016). Patient safety, including medical errors, is among the most significant issues facing healthcare systems globally (Government of Canada, 2019). Medical errors have become the focal point for patient safety and quality improvement (Folligah, 2018). However, underreporting of errors is a prevalent issue that must not be ignored if medical errors are to be prevented. The purpose of this paper is to identify and describe, through a literature review, the types and causes of physician error, the reporting mechanisms of error, as well as the predominant factors which can affect physician error reporting behaviour.

Healthcare is not as secure as it should be. Studies have shown that patient safety, as well as healthcare systems themselves, are vulnerable to error and that the risk of adverse events is fairly high (AIIC, 2014). Kohn et al. (1999) defined error as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" (p.28), while an adverse event can be described as unintentional physical harm as a result of medical care that can lead to additional treatment, monitoring or hospitalization, or in some cases death (AHRQ Patient Safety Network, 2019). The renowned Institute of Medicine (IOM) report titled *To Err is Human* by Kohn et al. (1999) called for a national effort to make healthcare delivery safer. The report sheds light on the fact that medical errors are frequent in healthcare and result in significant harm. They concluded that errors cause between 44,000 to 98,000 deaths every year in U.S hospitals and over one million injuries (Kohn et al., 1999). As a whole, the report provided a summary of key

epidemiological studies of medical error and examined the implications of those studies (Kohn et al., 1999). They also reviewed the necessary changes in leadership, reporting, and the healthcare system required to reduce the prevalence and impact of error (Kohn et al., 1999). Furthermore, healthcare is a high-risk profession, and when compared to other hazardous industries like aviation, it appeared to be out of date in regards to reporting practices, feedback, and improvement (Kohn et al., 1999). For example, aviation reporting processes are 'blame-free' and look at errors as a learning opportunity and incorporate them into their training practices (Kapur et al., 2015).

The IOM report laid out a clear plan for the US to address medical errors as follows: setting national goals for patient safety, calling on healthcare organizations to commit to patient safety improvement, and reducing medical error by 50% within five years (Kohn et al., 1999). The report stressed the importance of the availability of knowledge and tools to improve patient safety and recommended the implementation of both mandatory and voluntary reporting systems (Kohn et al., 1999). US federal funds were allocated to help determine the causes of preventable medical errors and then design, test, and evaluate solutions to reduce medical errors (Clancy, 2009). This information could then be disseminated to the healthcare industry to provide the basis for solutions (Clancy, 2009). Consequently, it has become evident that not only are medical errors complex, but it is also difficult to accurately measure their progression over time (Clancy, 2009). However, both patient safety and progress could be assessed by the regular use of reporting systems. Also, patient safety improvement in the ten years following the IOM report was primarily left to each hospital or provider organization's discretion to undertake their own safety initiatives and policies (Clancy, 2009). Almost two decades after its publication *To Err is Human:*

Building a Safer Health System is still frequently cited (Schiff et al., 2009; Paterick et al. 2009; Graber et al., 2013; Makary & Daniel, 2016; Lee et al., 2015; Scott & Henneman, 2017; Sheikhtaheri et al., 2018; Zabari & Southern, 2018). The report sparked the patient safety movement and was the catalyst for many subsequent initiatives, including reports released by Health Canada.

Following the publication of *To Err is Human*, Health Canada released the *Patient Safety and Healthcare Error in the Canadian Healthcare System Report* in 2001. This report highlighted the limitations in knowledge regarding the number of adverse event errors and the lack of initiatives to improve patient safety (Baker & Norton, 2001). The report was based on literature reviews, telephone surveys, and an analysis of the gaps between Canadian initiatives and leading work in other countries (Baker & Norton, 2001). The report highlighted a comparison of the Australian, American and British systems. It showed that each country had established committees with the directive to examine adverse events and error incidences and develop recommendations to address system deficiencies, while also improving reporting (Baker & Norton, 2001). This report's findings indicated that a lack of human and financial support dedicated to patient safety was a major barrier to Canada's progress (Baker & Norton, 2001). It also revealed that historical surveillance systems (e.g., incident analysis and mortality reviews) were not functioning well or were not present; thus, there was a need to develop systems that would allow regional and national sharing of information to improve patient safety (Baker & Norton, 2001). Moreover, this report produced recommendations for future direction categorized under four themes: (i) to build awareness and set patient safety as a priority, (ii) to develop better reporting systems, (iii) to build skills, disseminate knowledge and implement systems to

improve safety, and (iv) to create organizational and policy level supports for patient safety efforts (Baker & Norton, 2001). Comparing the different countries' patient safety initiatives demonstrated that Canada needed a more in-depth study to understand the magnitude of adverse events.

The *Canadian Adverse Events Study* was the first of its kind. It estimated the frequency and types of adverse events in hospitals in several provinces and included both medical and surgical care (Baker et al., 2004). This cross-provincial study reviewed de-identified adult patient charts from the year 2000 and found 1133 injuries and complications, where 46.7% of them resulted in disability, prolonged stay, and even death (Baker et al., 2004). It also revealed that adverse events resulting from physician diagnosis or treatment errors were more common than errors of commission or general mistake (Baker et al., 2004). The total number of adverse events was estimated between 141 250 to 232 250 patients out of 2.5 million admissions to acute care during the study period (Baker et al., 2004). The preventable deaths caused by an adverse event were estimated between 10 000 to 20 000 patients (Baker et al., 2004). Baker et al. (2004) suggested that by modifying the physician work environment to reduce the culture of blame, there would be an increase in patient safety as communication and coordination among caregivers would create a greater defence against adverse events. Now, 16 years after the 2004 Canadian Adverse Events Study (Baker et al., 2004), efforts continue to be made to increase patient safety. Despite these efforts, underreporting is still a prominent issue in healthcare today (CIHI, 2016).

Underreporting of errors remains an underlying issue that creates a lack of necessary data to understand the factors that contribute to errors, including system design failures (Denny, 2017). Underreporting prevents healthcare providers from learning from errors

which subsequently could have prevented further patient harm (Paterick et al., 2009; Denny, 2017; McGlynn et al., 2015). Some suggest that the worst mistake that could be made is to not learn from an error, which is precisely what happens when physicians fail to report an error that could have led to improved learning opportunities (Paterick et al., 2009). Physician error incidence data is needed to measure and address errors with accuracy. Most statistical data collected in existing studies have merely estimated the number of errors through patient accounts, autopsies, death certificates, physician surveys, and discharge databases (Makary & Daniel, 2016; Graber, 2013; CIHI, 2016). While these data are relevant and important, they are retrospective, which fails to address the issue proactively. For example, autopsies are considered the gold standard for providing definitive data on diagnostic accuracy (Graber, 2013). Measuring diagnostic errors generally requires a sophisticated review of each patient chart and a lengthy follow-up; however, errors are often not identified promptly and may not be found for months or even years (Singh, 2013; Wachter, 2010). Therefore, we still do not possess accurate data regarding frequency or incidence rates (Singh, 2013; Wachter, 2010). Unfortunately, along with the extended time frame of identifying errors, the disinclination of physicians to report their errors obscures the true real-time prevalence and incidence data, as well as information that would be helpful for error prevention (Paterick et al., 2009). Improved reporting practices and systems may create more reliable and complete data to measure and study errors associated with medical practice as "you cannot fix what you do not measure" (Graber, 2013, p. 25). Many studies have compared healthcare patient safety practices to aviation safety regulations (Gaba, 2011; Kapur et al., 2015; Kothari et al., 2010; Reason, 2000). In aviation, the myriad of checklists, limiting work hours, simulation

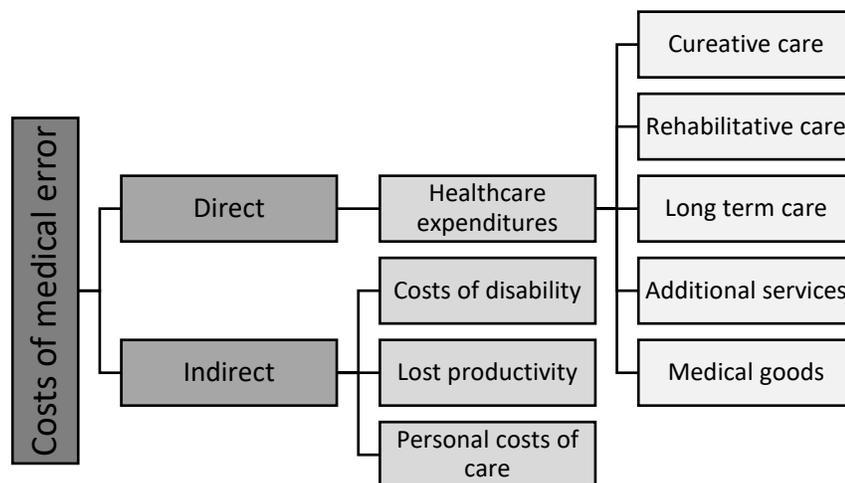
training, and other practices have proven to make aviation incredibly safe (Kapur et al., 2015). Healthcare should continue to learn from and adapt similar practices to that of the aviation industry including a blame-free culture that reduces risk. Just as aviation relies heavily on the pilots to ensure safety, healthcare relies on the physician to provide the most effective care possible. Since Flanagan (1954) first shed light on the investigation of critical incidents to improve military pilots' performance and safety, healthcare organizations have endeavoured to learn from error and incident analysis (Anja et al., 2016). All industries have liability concerns; however, healthcare creates a unique setting in comparison. Physicians, who are sometimes the single responsible provider of care, determine the level and content of service received and have significant responsibility for their patients' well-being and the decisions regarding their treatment (Kohn et al., 1999). This distinctive arrangement of decision-making in healthcare creates a unique set of liability issues and challenges in creating an environment conducive to recognizing and learning from errors (Kohn et al., 1999). Although other health professionals may provide patient care, it is evident from the literature that physicians arguably play the largest role in error and thus error reporting.

A significant number of studies have provided valuable insight into the magnitude of harm resulting from physician errors and indicate that there remains room for improvement in patient safety practices (CIHI, 2016; Kohn et al., 1999; Sheikhtaheri et al., 2018; Tawfik et al., 2018; Van Den Bos et al., 2011). A considerable body of evidence points to medical errors as a leading unrecognized cause of death and injury (Kohn et al., 1999; Makary & Daniel, 2016; CPSI, 2017). According to a study conducted in 2016, over 250,000 deaths result from medical errors in United States hospitals each year (Makary & Daniel,

2016). In fact, patients are more likely to suffer serious consequences in critical care settings due to the severity of their symptoms (Kohn et al., 1999; Rodziewicz & Hipskind, 2019; Latif et al., 2013). A study conducted using 564,000 inpatient injuries and 1.8 million outpatient injuries revealed that the most frequent consequences of medical errors are: pressure ulcers, post-operative infection, hemorrhage complications, accidental puncture or laceration during a procedure, a mechanical complication of devices, grafts or implants, hematoma complications, adverse effects of drugs or biological substances, and mechanical complications of a cardiac device (Van Den Bos et al., 2011). Adverse outcomes such as increased mortality rates, infections, assortments of disabilities or injuries, loss of wages, and legal implications that seek accountability, compensation, and retribution are just a few possible consequences of error (Merry, 2009; CIHI, 2016, Tawfik et al., 2018).

In addition to the negative health consequences resulting from error for both patient and physician, there are direct and indirect costs that society as a whole has to pay as a result (Kohn et al., 1999). *Figure 1* represents a summary of the types of costs of medical error that were described in Kohn et al., 1999

Figure 1: Summary of The Costs of Medical Error (Kohn et al., 1999)



According to a study completed by the Canadian Institute for Health Information (CIHI, 2016), an analysis of patient health records and hospital discharge databases revealed that between 2014 and 2015, patients suffered preventable harm in more than 138,000 different hospitalizations. Consequently, within one year, over 138,000 hospital beds and additional resources were made unavailable to other patients. The study revealed that the hospital costs attributed to error, not including physician fees or follow-up care, was an estimated 685 million dollars from 2014 to 2015, or 1% of Canada's 2014 total hospital budget (CIHI, 2016). Furthermore, a 2017 report commissioned by the Canadian Institute for Patient Safety (CPSI) indicated the number of cases of preventable harm is equivalent to a PSI occurring every minute and eighteen seconds, as well as a resulting death every thirteen minutes and fourteen seconds in Canada (CPSI, 2018).

Although these results have described the number of deaths, injuries, and costs attributable to medical error, the exact number of people harmed by medical mistakes is unknown, in part because many or most are unreported (Scott & Henneman, 2017). Not only are errors underreported in hospital documents but also on death certificates (Makary & Daniel, 2016). Therefore, the data are still not representative of the true levels of error. In the United States, 10% of deaths are documented as caused by error; however, Makary & Daniel (2016) suggested that it is likely closer to the third leading cause of death in the United States. Further research is needed to explore the factors that influence reporting behaviour and kickstart more patient safety initiatives and policies to encourage physician error reporting.

Additional studies that address the reasons for underreporting are needed to improve physician reporting behaviours. Implementing reporting policies and efficient

practices may enable a more accurate estimate of deaths attributed to errors. Increasing opportunities to improve prevention through learning from error may also result in a subsequent reduction of hospital costs, all of which would benefit the Canadian healthcare system. In my research paper, I explored the various types and causes of physician error, the reporting practices and processes in Canada, and the factors that influence physician error reporting behaviour.

Situating the Researcher

Physician error has undoubtedly affected many people in the Canadian population, myself included. At the very root of this topic of choice was the fact that a family member passed away as a result of physician error. My six-year-old niece passed away from complications following an error made during the treatment of her congenital heart condition. The physicians that were responsible disclosed what happened and apologized to my family. The error was subsequently reported to the institution and as a result, policies and practices were changed to ensure that the error would not be made again. However, my niece lived for only three years with a debilitating disability before succumbing to her injuries and illness as a result of this error. It is reassuring to know that other children will not have to experience similar trauma as my niece because of the reporting behaviours of the physicians responsible.

Research Questions

Physician error is an important issue in healthcare which can cause significant threats to patient safety. Not only can harm befall patients following error, error can also cause a significant monetary strain on the healthcare system. Underreporting of errors prevents physicians and the healthcare industry from being able to learn from their errors and further puts patients at risk to be subject to the same errors over again. This paper will address the following questions:

- 1. What are the types of physician error and their common causes?*
- 2. What are the mechanisms to reporting error?*
- 3. What are the factors that influence physician clinical error reporting behaviours?*

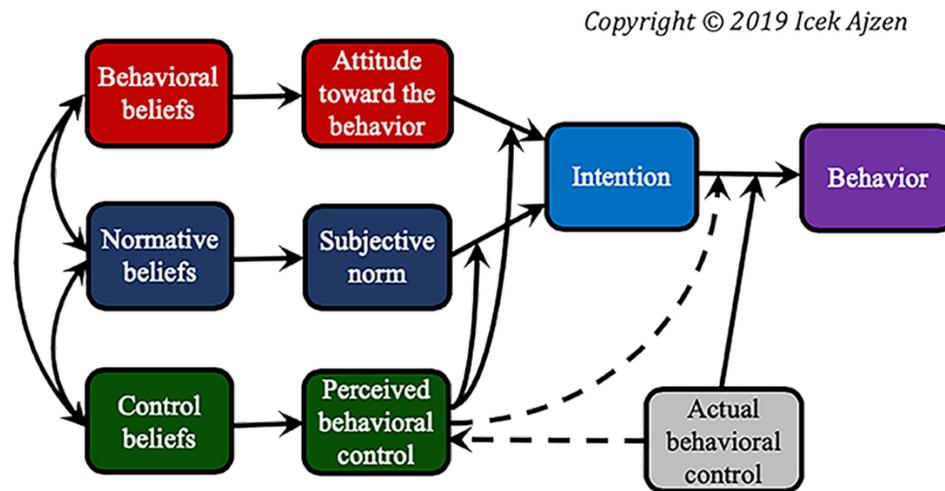
Approach

The Theory of Planned Behaviour (Ajzen, 1985) was used to guide the literature search as well as to structure the results of this paper. The theoretical framework and its three constructs will be explained in greater detail. Further, the literature search strategy will be described to clarify how data was gathered as well as the exclusion and inclusion criteria.

Theoretical framework

To explore physician error reporting behaviour and the factors that influence it, I have used the Theory of Planned Behaviour (TPB) as the lens to structure my literature review. The TPB was developed from the Theory of Reasoned Action to predict and explain individuals' behaviours and intentions (Folligah, 2018). The TPB suggests that a person's intention to engage in behaviour is determined by three constructs: attitude toward the behaviour, subjective norms, and perceived behaviour control (*Figure 2*) (Ajzen, 1985). In turn, combining these three constructs will lead to intentions to engage in a behaviour, which could then lead (or not) to the actual behaviour itself (Folligah, 2018).

Figure 2: Theory of Planned Behaviour Model (Ajzen, 1985)



From “Theory of Planned Behaviour Diagram” by Ajzen, I., 2019 (<https://people.umass.edu/ajzen/tpb.diag.html>). Copyright 2019 by Ajzen, I (2019). Reprinted with permission on April 19th, 2021

A systematic review by Godin et al. (2008) identified the TPB as the socio-cognitive theory most often used to predict behaviours in healthcare professionals. It concluded that the TPB performed favourably compared to other theories and that the studies using the TPB had significantly better predictive power (Godin et al., 2008). Furthermore, authors of a systematic review demonstrated that the TPB was useful to explain physicians' behaviours and intentions and that subjective norms were the most frequently and significantly associated with intention to perform a behaviour (Thompson-Leduc et al., 2015). After surveying 1,200 nursing staff, Lee et al. (2015) found a link between the TPB concepts and the nurses' intention to report incidents. The findings indicated that behavioural attitudes, social norms, and perceived behavioural control have a significant association with the intention to engage in incident-reporting behaviour. The work by Lee

et al. (2015) "confirms that the TPB can be applied to behavioural patterns or models for the reporting of adverse events" (p.13).

To address this major paper's research question, the TPB (Ajzen, 1985) is used as a means of identifying and illustrating how certain factors can influence error reporting behaviour. Each factor associated with physician error reporting is explained in relation to the TPB's constructs which lead to the intention to engage in the reporting behaviour. TPB focuses on "intention", which suggests a person's behaviour is most strongly determined by their intention to engage in specific behaviour and intention is considered the direct antecedent of that behaviour (Ajzen & Fishbein, 2005). The stronger the intention, the greater the possibility the behaviour will be performed (Lee et al., 2015). The TPB suggests that a person's intention to engage in behaviour is determined by three constructs: (i) attitude toward the behaviour, (ii) subjective norms, and (iii) perceived behaviour control (Ajzen, 1985). In turn, combining these three constructs will lead to intentions to engage in a behaviour, which could then lead (or not) to the actual behaviour itself (Folligah, 2018).

Attitude Toward the Behaviour

According to Ajzen's (1985) work, attitude is directly affected by the person's behavioural beliefs. A behavioural belief is a subjective likelihood that the behaviour will produce an outcome, more specifically, the beliefs regarding the likely consequence of the behaviour. Ajzen (1985) suggests that the personal evaluation of each possible outcome will directly contribute to the attitude toward the behaviour. Furthermore, this evaluation relates to the perceived probability that the behaviour in question will produce the imagined outcome (Ajzen, 1991). The attitude toward a specific behaviour is based on the

positive or negative significance that a person associates with that specific behaviour (Ajzen, 1985).

Subjective Norms

The second construct in the TPB model consists of subjective norms, which can be described as a person's perceived social pressure to engage or not engage in a particular behaviour (Ajzen, 1985). Moreover, the subjective norms construct is directly influenced by the normative beliefs of the person. Normative beliefs refer to the behaviours that a person believes are expected of them by influential individuals or the perceived "normal" behaviour (Ajzen, 1991). Influential individuals can include a spouse, a colleague, a friend, a superior, and any other significant people in the person's life (Ajzen, 1985). Furthermore, normative beliefs, and a person's willingness to conform to the social pressures created by influential individuals, determine subjective norms (Ajzen, 1991). For example, if a physician believes that their supervisor expects them to report an error and their colleagues all engage in reporting behaviour, then the physician may be more likely to report an error as the subjective norm reinforces the performance of the behaviour.

Perceived Behaviour Control

The final construct in the TPB model is perceived behavioural control. Perceived behavioural control refers to a person's view of their ability to perform a specific behaviour, which can also be thought of as self-efficacy (Mimiaga et al., 2009). For example, if an individual perceives that they are capable of a specific behaviour (i.e., they believe that they possess the requisite knowledge and have access to appropriate resources to do so),

their perceived behavioural control is reinforced (Ajzen, 1985). Equally, if a person perceives that the execution of a specific behaviour is difficult, they would have a weak intention to perform the behaviour (Ajzen, 1985). Perceived behavioural control is influenced directly by control beliefs which refers to the beliefs about the presence or absence of factors that may facilitate or hinder the performance of the behaviour. If there are factors that facilitate the ability to perform the behaviour, then the perceived behavioural control will be reinforced (Ajzen, 1991). For example, if some tools and aids can help the physician report the behaviour and believe they have the capabilities to engage in reporting behaviour, then the reporting behaviour will be reinforced.

Literature Search Strategy

The literature search was conducted electronically using the Laurentian University Library to access platforms such as Science Direct, Proquest Platform Database, Google Scholar, PubMed, and Sage Journals, Scopus as well as EMBASE. Bibliography mining and searching cited references was used to find important and related articles. The focus of the articles included in the literature review included articles, reports or studies that discussed or revealed pertinent information regarding physician or medical error reporting, types of error, the theory of planned behaviour and physician error reporting, the impact of specific factors on error reporting and the prevalence of errors. The literature search terms used during data collection included, but were not limited to, the following terms: physician error, error reporting, error reporting behaviour, causes of error reporting, error reporting systems, types of error reporting, error reporting in aviation, the theory of planned behaviour, medical error, medical error costs, patient safety, medical error policy Canada,

medical error legislation Canada, aviation and medical error, psychological safety and reporting, guilt and error reporting, fear and error reporting, shame and error reporting, manager support and error reporting, feedback and error reporting, peer support and error reporting, teamwork and error reporting, whistleblowing and error reporting, safety culture and error reporting, time and error reporting, attitude and error reporting, subjective norm and error reporting, self-efficacy and error reporting, and finally, perceived behavioural control and error reporting.

Inclusion criteria for articles to be considered in the literature review were as follows: (i) articles published between 2008 to present (excluding foundational works important to the theoretical framework and definitions of error), (ii) articles focusing on practicing physicians and residents at any stage of their career, referring to any types of error, and errors in all types of care in a hospital setting, and (iii) articles published in English or French.

Physician Error

Patient safety incidents (PSIs) of many kinds can occur while physicians provide care. The physician's role in diagnostic and treatment errors is explored further to comprehend how and why these errors are being made. Moreover, it is crucial to understand the various causes of physician error. Most causes can occur at any time in the care process regardless of the type of error made. This sections addresses research question 1: What are the types of physician error and their common causes?

Types of Error

There are two categories of error: errors of commission, referring to incorrect actions taken, and errors of omission, referring to failure to take needed action (Rodziewicz & Hipskind, 2019). In the literature, there are multiple types of error, however, the errors that are primarily physician related can be categorized as diagnostic errors and treatment errors (Kohn et al., 1999).

Diagnostic Errors:

Errors associated with a missed or delayed diagnosis frequently cause PSIs and can be defined as any error or failure in the diagnostic process that can lead to a missed or delayed diagnosis, or a complete misdiagnosis (Schiff et al., 2009). This definition may include but is not limited to, any failure in the interpretation of signs, symptoms, or laboratory results, failure to offer timely access to care, failure formulating differential diagnoses as well as lack of timely specialty referral, follow-up care or evaluation (Schiff et al., 2009). The

process of ordering, executing, deducing and acting upon diagnostic tests remains vulnerable to error (Singh, 2013). It is estimated that diagnosis in medicine is incorrect 10-15% of the time (Graber, 2013).

Diagnostic errors continue to be difficult to measure since they are largely related to the cognitive processes and performance of each physician (Singh, 2013). Using a human factors perspective on diagnostic performance, Henriksen & Brady (2013) revealed that even under the best circumstances, physician knowledge and cognition are at times insufficient and are inherently related to the clinician's biases, knowledge, data collection, and synthesis skills. Although diagnostic errors may be a result of a lack of knowledge or skills, they are implicated less frequently than physician biases (Henriksen & Brady, 2013; Bordini, Stephany, & Kliegman, 2017).

Cognitive biases may present during any point in the physician's diagnostic process and typically are found in one of three forms: heuristic failure, errors of attribution, or errors of context (CMPA, 2019; Bordini, Stephany, & Kliegman, 2017). Understanding the illness in question depends on the physician's ability to draw a concise and complete patient history and examination, their recognition of and experiences with the disease, and considerations of the individual patient factors (Bordini, Stephany, & Kliegman, 2017). *Table 1* summarizes the types of cognitive biases that were presented Bordini, Stephany, & Kliegman text (2017).

Table 1: Cognitive Biases which Influence Physician Diagnosis (Bordini, Stephany, & Kliegman, 2017)

	Heuristic failures	Errors of attribution	Errors of context
Definition	When the physician's intuitive systems fail (ie. mental shortcuts)	When the physician's internal factors related to culture or personality affect decision-making	When the physician's external factors regarding the diagnosis influence their approach
Cognitive Biases	<ul style="list-style-type: none"> - Anchoring - Confirmation - Expertise - Overconfidence - Unpacking principle - Premature closure 	<ul style="list-style-type: none"> - Affective bias - Appeal to authority - Attribution error - Outcome bias - Psych-out bias 	<ul style="list-style-type: none"> - Availability bias - Base rate neglect - Framing effect - Frequency bias - Hindsight bias

Anchoring bias occurs when the physician focuses on a single diagnosis and fails to recognize new information or symptoms, which could alter treatment (CMPA, 2019). The attribution error bias occurs when the physician blames the patient's personality for their illness instead of considering the external factors that could cause the disease (i.e. obesity) (CMPA, 2019). Finally, availability bias occurs when the physician bases their diagnosis on a recent patient with similar symptoms, simply remembering recent and more common diseases (CMPA, 2019). While diagnostic errors remain the most researched and recognized of the two types, treatment errors can contribute to PSIs.

Treatment Errors:

Errors in treatment refer to errors in the physician's care management of a patient's illness or disease (Miller et al., 2010). Treatment errors may occur in any aspect of treatment including prescription medications, wound closing, administration of oxygen, or devices designed to immobilize parts of the patient's body, but excludes diagnostic

procedures, counselling or observation, as well as first aid to the patient (Miller et al., 2010).

The treatment errors made by physicians that are most frequently cited in the literature are prescription/medication errors (Kothari et al., 2010; Miller et al., 2010; Muñoz et al., 2010), and surgical/procedural errors (Anderson et al., 2013; Shouhed et al., 2012; Zegers et al., 2011). A study conducted at a Vancouver hospital identified that 47% of 151 patients studied, were exposed to a medication error following admission (Stockton et al., 2017). A medication error can be defined as a preventable event that can lead to or cause patient harm through incorrect medication uses "during prescription, transcription, dispensation, or administration of the medication" (Muñoz et al., 2010, p. 335). The various treatment errors related to medication are outlined in *Figure 3*.

Figure 3: Summary of the Types of Medication Errors from Miller et al. (2010)

Prescription

- Inappropriate dose
- Wrong route
- Order duplication
- Illegible handwriting
- Wrong frequency

Transcription

- Wrong medication
- Wrong diluent
- Wrong formulation
- Inaccurate labelling

Administration

- Incorrect infusion rate
- Wrong time
- Unauthorized dose
- Wrong medication
- Omitted dose

Medication errors are common in healthcare. A study of 2266 Canadian anesthesiologists revealed that 30% had experienced one or more medication errors

during their careers (Kothari et al., 2010). Medication administration errors were the most common (56.4%), followed by dispensing errors (35.7%) then transcription errors (24.2%) (Miller et al., 2010).

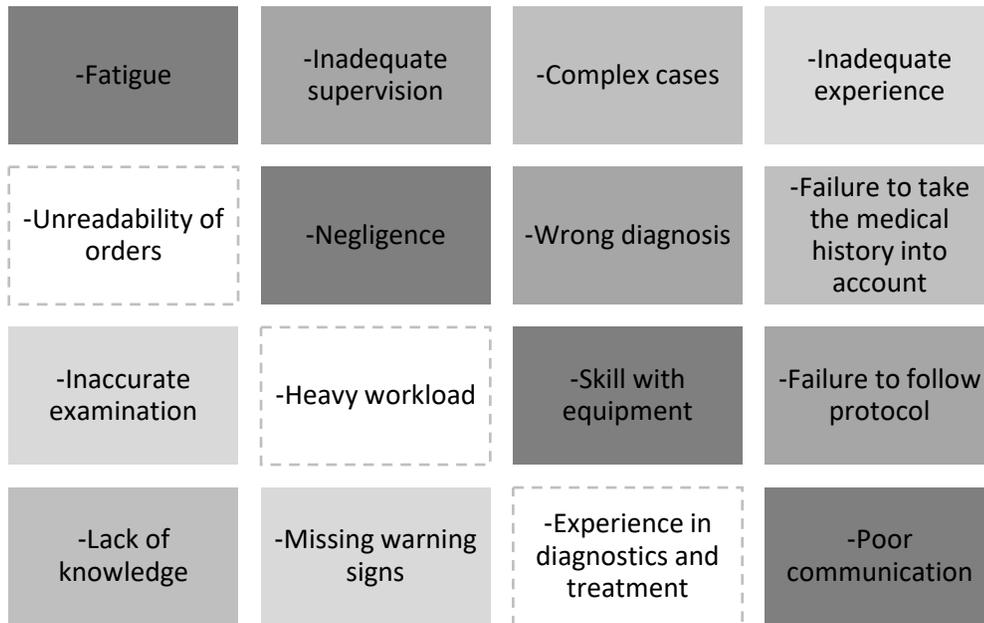
Surgical errors are important as studies have suggested that operating rooms (ORs) are the most likely place for an error to occur (Arora et al., 2010; Shouhed et al., 2012). ORs are commonly high-stress and require quick decision-making skills while working alongside a team of interdisciplinary health professionals (Shouhed et al., 2012). The complex nature of the OR setting has many distractions, involves excessive noise and equipment issues and creates opportunities for poor communication between staff increasing the likelihood of surgical errors (Arora et al., 2010; Shouhed et al., 2012). Arora et al. (2010) found that surgeons perceived patient, technical/tactical, and equipment factors as the most stressful and frequent elements leading to an error in the OR. Bosma, Veen, & Roukema (2011) found that the most common surgical errors with the highest complication rates were vascular surgery (28.3%), thoracic surgery (49.5%), gastrointestinal surgery (28.3%) as well as trauma surgery (21.1%). Additionally, they found that surgeon caused errors were found in surgical technique and performance, as well in formulation of pre- or post-operative treatment plan (including choice of the procedure) (Bosma, Veen, & Roukema, 2011).

Causes of Error:

The causes of medical error that have been discussed in the literature can be grouped as managerial, patient-related, attributable to the laboratory and pharmacy, and physician/provider causes (Sheikhtaheri et al., 2018). While all these causes are important, in the scope of this paper, only the physician related causes will be discussed. *Figure 4*

presents a summary of the physician related causes of error from Bari et al. (2016), Hall et al. (2016), as well as Sheikhtaheri et al. (2018).

Figure 4: Summary of physician-related causes of medical error (Bari et al.2016; Hall et al., 2016; Sheikhtaheri et al., 2018)



Many of the physician-related errors that are displayed in *Figure 4* are linked to factors such as poor well-being and burnout in healthcare professionals which have been associated with a significant reduction in patient safety (de Oliveira et al., 2013; Parks-Savage et al., 2018; Tawfik et al., 2018; Van Gervan et al., 2016; Welp et al., 2015). Physician excessive fatigue is reported by 45% of physicians and burnout in the United States is estimated at $\geq 50\%$ (Tawfik et al., 2018; Van Gervan et al., 2016). Difficult multi-day shifts and heavy workload have harmful effects on well-being and intensifies fatigue, which subsequently, increases the potential for medical errors (Salen & Norman, 2018). Labour hour constraints are placed on physicians in training mandating a maximum 80-hour work week due to the fact that the residents traditional 24-30-hour shifts pose threats to patient

and physician safety (Salen & Norman, 2018). Sleep deprivation has negative effects on multiple aspects of function, capacity, cognizance, recollection as well as cognition (Rosenbluth & Landrigan, 2012). In fact, fatigue impairs the mental state similar to alcohol intoxication, where mental capacity declines after 17 hours of intense cognition and awareness (Rosenbluth & Landrigan, 2012). As fatigue and depression increase, reporting of medical errors by residents increases from 15% to 28% (Salen & Norman, 2018). Interns and residents who are more sleep deprived are at a higher risk for depression, which also correlates with increased medical errors (Kalmbach et al., 2017).

The suicide rate among physicians is three to five times higher than the general population, and they also have a higher alcohol consumption rate (Tawfik et al., 2018; Van Gervan et al., 2016). This poses a significant threat to patient safety and can increase the number of errors (Van Gervan et al., 2016). Burnout is an important aspect of work-related psychological health as it is a reflection of the chronic and severe response to stress in the workplace (Maslach & Jackson, 1981). The foundational works of Maslach & Jackson (1981) explain that there are three dimensions of burnout: emotional exhaustion (EE), depersonalization, and decreased personal accomplishment. EE is the most important dimension of burnout, emotionally exhausted physicians feel fatigued and unable to face the demands of their job or engage with people (Maslach & Jackson, 1981). As such, physicians experiencing EE may experience a lack of physical and cognitive ability causing them to only execute necessary tasks to save energy leading to an error (Welp et al., 2015). Physicians experiencing EE from burnout may be less able to process their environment's cognitive demands, pay less attention to detail, and are more likely to commit errors (de Oliveira et al., 2013; Welp et al., 2015). For example, in a study conducted by de Oliveira et

al. (2013), respondents at high risk of burnout were less likely to double-check prescriptions for correct administration than those at low risk of burnout. The second dimension of burnout, depersonalization, refers to both the emotional and cognitive detachment from the job (Maslach & Jackson, 1981). As physicians develop a negative attitude toward their patients, they can be disinclined to observing or communicating with them, this can lead to a loss of important information and can reduce the quality of care, subsequently leading to an error (Welp et al., 2015). Finally, reduced sense of control and accomplishment speaks to the feeling of not being able to make a meaningful contribution at work and reduces the physician's efficacy (Patel et al., 2018). As such, physician burnout has a direct association with medical error and could very well be the cause of many preventable PSIs in medicine.

Failure to take the medical history into account and accurately examine the patient is a main cause of error (Sheikhtaheri et al., 2018). The primary purpose of obtaining a medical history from the patient is to comprehend the state of health and determine if the history is directly related to the diagnosis (Nichol et al., 2020). The secondary goal is to acquire the information needed to avoid potential harm to the patient during the course of treatment, and this is especially important for medication errors (Nichol et al., 2020). Medication histories are vital in preventing prescription errors and detecting medication-related pathology (Fitzgerald, 2009). The physician must conduct all diagnostic measures including physical examination and patient history to provide an accurate diagnosis and minimize the risk of error. Consequently, approximately one in ten autopsies reveals that the patient had a disease or condition that, had it been known when they were alive, would have altered their prognosis or care (Wachter, 2010).

In some of the literature, poor communication is considered as a type of error; however, poor communication is more likely a causal factor of medical error. Lack of communication can create a breeding ground for medical errors which puts the patient at risk due to misinterpretation of information due to unclear instructions or lack of critical information (O'Daniel & Rosenstein, 2008; Maughan et al., 2011). For example, a physician's interpersonal and communication skills should support the collection of information for accurate diagnosis while ensuring effective patient comprehension, as well as creating trust in the doctor-patient relationship (Ha et al., 2010). Delivery of care involves numerous patient handoffs between healthcare practitioners and poor communication from the physician about the patient's active medical issues has been associated with critical incidents post-handoff (O'Daniel & Rosenstein, 2008; Maughan et al., 2011). For this reason, communication and ongoing teamwork are essential to minimize errors. The Joint Commission Center for Transforming Healthcare identified poor communication as the most significant common factor implicated during an analysis of more than 4,000 adverse events (Halverson et al., 2010). In a study conducted in an OR environment, 76 communication failures were observed over the course of 150 hours (Halverson et al., 2010). 36% of communication errors were found to be related to equipment and keeping team members informed of patient progress and status (Halverson et al., 2010). These factors all contribute to the increase of physician error in the healthcare setting, which should be reported using the necessary reporting process.

Reporting process in Canada

In this section, the error reporting processes in Canada are discussed. Since aviation is well known for its safety protocols, its practices could be transferrable to improve patient safety. Included below is a short comparison of the reporting and error prevention practices in aviation. This section also explains important information encompassing how a reporting system should be used, pertinent data that should be included in the report, types of reporting systems, as well as Canadian policies and legislation regarding error reporting. Finally, physicians' responsibility to report is described to highlight the importance of ethics in medicine. These are important to understand as some of the key factors influencing reporting behaviour are the reporting system and process. This section addresses research question 2: What are the mechanisms to reporting error?

Aviation Practices and Healthcare

Safety practices in healthcare have often been compared to the safety climate in aviation. The aviation and healthcare industries are similar since both involve highly trained professionals who practice their trade using advanced technology in high-risk situations (Kao & Thomas, 2008). However, aviation seems to be much safer than providing care for the human body. For example, between 2009-2019, a total of 65 aviation accidents and eight fatalities occurred in Canada on scheduled commercial flights where the airplanes weighed above 5.7 tonnes (ICAS, n.d.). Whereas in Canadian healthcare, as previously stated, a preventable death occurs every thirteen minutes and fourteen seconds (CPSI, 2018). As the renowned Captain Chelsey "Sully" Sullenberger has previously stated, "if such a level of fatalities was to happen in aviation, airlines would stop flying; no one would be allowed to fly until the problem had been solved" (Sullenberger, 2013, p. 52).

That being said, human beings are not like airplanes and we cannot close down hospitals while we find the source of the problem because they are vital to human welfare (Gaba, 2013). Nevertheless, if we aim to improve patient safety, we could learn from the aviation industry by translating and adapting their practices (Gaba, 2011).

There are many things to consider between both industries. *Table 2* from Kapur et al. (2015) illustrates key differences between healthcare and aviation. The unpredictability and inability to standardize every aspect of care is a key feature to consider when comparing the two industries. There are many things we could translate from aviation to medicine. For instance, aviation safeguards require pilot qualification, including pilot fitness for duty (i.e. fatigue, alcohol consumption) (Kapur et al., 2015; Singer et al., 2010). In healthcare, work-hour limitations exist only for physicians in training and not for experienced personnel, unlike aviation, where pilots of all levels are held to the same standard (Singer et al., 2010). Moreover, aviation safeguards and equipment procedures require checklists before takeoff (Kapur et al., 2015). Checklists have been applied in surgery in the last decade contributing to a decrease in morbidity and mortality yet the adoption of their use is not a requirement (McConnel et al., 2012). Preoperative planning with checklists serves as a cognitive aid having many benefits for the team as well as the surgeon, creates open communication before surgery and ensures nothing is forgotten (Gaba, 2011; Schelkun, 2014).

Table 2: Distinctive features of aviation and healthcare (From Kapur et al., 2015, p. 2)

Domain	Aviation	Healthcare
History	- Hundreds of years	- Hundreds of thousands of years
Key Raw Material	- Aircraft, usually less than 30 years old, serviced every few months	- Human bodies, can live to around 100 years, check- up every 1-2 years or less frequently
Activities	- Pilots operate one or two types of aircraft - Episode usually lasts 1-10 hours, with same crew on board	- Health care professionals have to deal with a wide variety of equipment, diseases and presentations - Duration of inpatient stay may be days or even years, with numerous changeovers of staff
Equipment	- There is a degree of standardisation of displays across aircraft - Most procedures are automated, with multiple back-up systems in place - Information such as weather conditions is automatically available	- There is relatively little standardisation of design across medical equipment - Automation of procedures, and back-up systems, are somewhat variable, with much of healthcare being 'hands-on'
Service Users	- Passengers are healthy - Passengers usually have little knowledge of the crew or aircraft or airline - Crew rarely know names of individual passengers, and the captain will seldom console a passenger personally if things go wrong	- Patients are sick, vulnerable and injured - Patients will often come equipped with well-researched information about their condition, their doctors and their hospital - Staff will know each patient well and may also become familiar with their families. A consultant will generally console a patient if things go wrong.
Service Delivery	- More homogenous - The same crew usually on board a flight - Pilots do not become acquainted with passengers, or have to console them if anything goes wrong - Comfort and luxuries rather than safety can be correlated with ability to pay - There are few subspecialties of pilots and crew	- More heterogeneous with a number of subspecialties - Health professionals get to know their patients and build up a rapport with them - Care is personal and patients are often involved in treatment decisions - Quality of care can be related to the ability to pay, especially in developing countries - There are many subspecialties in healthcare
Safeguards	- Many safeguards are in place with a high degree of automatization and computerised support - There are strictly enforceable rules to exclude adverse effects of fatigue or alcohol on pilot's performance	- Limited safeguards, hands-on work, and a relative lack of automatization and computerised support - Lack of strictly enforceable rules to exclude adverse effects of fatigue. Rules about alcohol are seldom made explicit or strictly enforced.
Safety	- Equal for everyone on plane - Fatalities can be over 100 at a time, and usually include the crew of the plane - The setting of targets is relatively infrequent, and rarely conflicts with passenger safety	- Can correlate with ability to pay, especially in developing countries - Fatalities generally involve one person. Staff fatalities directly associated with patient care are very rare. - Targets may often be present, and may on occasions conflict with patient safety
Adverse Events	- Major adverse events are always investigated by a national body - Major adverse events are often featured in the media - Pilot immunity is often part of the reporting culture - Adverse event investigation reports are always published	- Major adverse events are usually only investigated locally, though may occasionally be subject to wide investigation - Major adverse events only occasionally feature in the media - Immunity is not necessarily part of the reporting culture, and disciplinary procedures are wide-ranging - Adverse event investigation reports are seldom published

From: "Aviation and healthcare: a comparative review with implications for patient safety" by Kapur et al., 2015, *JRSM Open*, 7(1), Copyright 2015 by Kapur et al. Adapted with permission received April 19th, 2021.

Another example lies in the fact that healthcare does not have vigorous incident investigation processes that are routine in aviation (Gaba, 2013). In Canada, PSI report investigation is conducted at the provincial level, but in aviation, it is conducted by a national board called the Transportation Safety Board of Canada (TSB). In aviation, major incidents are recreated in a simulated environment and become part of pilot training and can help distinguish what is needed to change during equipment design (Kapur et al., 2015). Additional aviation safety practices could be adapted to healthcare by imposing non-punitive/blame-free reporting standards and publishing the lessons learned from the PSI investigation and implementing these into training (Kapur et al., 2015; Singer et al., 2010).

While PSI reporting policy in Canada varies depending on the province, aviation has the TSB of Canada (TSB, 2020). The TSB was created by an act of parliament in 1990 with the mandate to advance safety in marine, pipeline, rail, and air transportation (TSB, 2020). Unlike in healthcare, this national safety board is responsible for all incident reports and investigations. The air occurrence reporting form can be found in *Appendix A*. This form is very easily located on the government of Canada website. Consequently, incident reporting is the same for all pilots in Canada, but for physicians, it remains different in some cases, depending on the hospital in which they are employed or the medical regulatory authority. The Transportation Safety Board Regulations SOR/2014-37 were created under the Canadian Transportation Accident Investigation and Safety Board Act S.C. 1989, c. 3. The Transportation Safety Board Regulations SOR/2014-37 includes the specific definitions of serious injuries and types of accidents that must be reported, the mandatory reporting practices required, the information required in the report as well as the imposed time limit

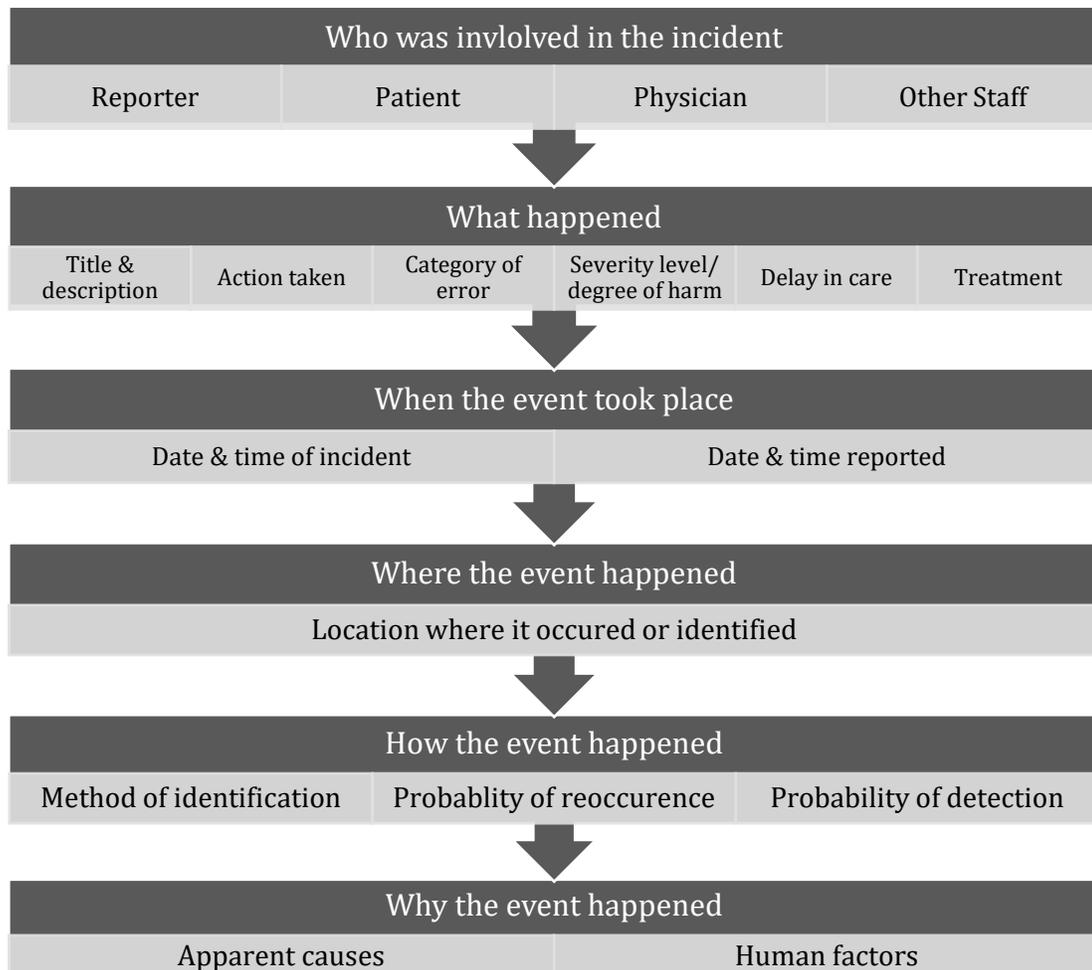
to report the incident. For example, The Transportation Safety Board Regulations SOR/2014-37 stipulates that "the owner, operator, pilot-in-command, any crew member of the aircraft and any person providing air traffic services that have direct knowledge of an occurrence must report aviation occurrences to the Board" (p.2). The regulation also says that the person reporting the incident must do so as soon as possible by the quickest means available (The Transportation Safety Board Regulations SOR/2014-37). This entire Canadian federal regulation is clear and concise in what is expected from every party involved in aviation, marine, pipeline and railway incidents. While medicine could learn some lessons from aviation reporting standards, it could prove difficult to implement since healthcare is a vastly different structure and domain.

Physician Error Reporting

Improving patient safety is no small task. A key component to improving patient safety is the prevention and management of medical error, which relies on error reporting systems (O'Hagan et al., 2009). Generally, a reporting and learning system is a formal or informal process where verbal or written accounts of adverse events are shared with others internally (i.e. within a department, facility, or organization) or externally to other governing bodies (White, 2007). They are meant to capture patient safety concerns and incidents and are intended to facilitate communication, learning, and overall improvement through the report's analysis (CPSI, 2020; Gong et al., 2015; Kohn et al., 1999; White, 2007). A reporting system is supposed to be both consistently available (White, 2007) and designed to promote improvement in care delivery by reducing variation, facilitating sharing of best practices, identifying recurring themes, and stimulating system-wide improvements (Health Quality Ontario, 2017). Furthermore, physicians expressed that

when reporting, it is preferred that filing the report not take more than five minutes; two minutes is preferred (Health Quality Ontario, 2017). It is vital that the reporting system not only collect data but also reduce error by analyzing the reports (Gong et al., 2015; Kohn et al., 1999) and subsequently implementing a corrective action plan (Baker et al., 2008). For analysis and corrective plans to take place, the physicians must first report the error made. Following an error, the physician involved, or witness to an error, is expected to complete the reporting form (Elliot et al., 2014). It is crucial that physicians are allowed to narrate their version of the events through open-ended questions and that the data represent all the key information summarized in *Figure 5* from the Health Quality Ontario (2017) study.

Figure 5: Error reporting form – Important data summary (Health Quality Ontario, 2017)



The error report should also contain information such as the patient's name, record number, diagnosis, location of the incident, assessment information, physician assessment, and follow-up actions required (Elliot et al., 2014). The aforementioned data are needed to reflect the true nature of the incident and expresses the chronology and factors that lead to the patient safety incident (Health Quality Ontario, 2017). Incident reporting can be filed immediately following the occurrence of the incident or at any time following the event (Health Quality Ontario, 2017; White, 2007). Once reporting is complete, the manager is responsible for ensuring the appropriate levels of authority are involved as well as ensuring follow-up action and feedback (Elliot et al., 2014). Feedback is an essential component of reporting. The feedback should come from multiple sources (e.g. high-level managerial staff, front-line staff) (Mahajan, 2010) and should be provided regularly regarding the details of recent errors, hazards, and the corrective action plan (Health Quality Ontario, 2017). Feedback must be given to encourage reporting practices (Mahajan, 2010). If the physician does not receive feedback, they are less likely to engage regularly in reporting behaviour. Many things can affect error reporting behaviour, including the type of reporting system used.

Types of reporting systems:

There are various types of reporting systems. The first type of system is the voluntary reporting system. Voluntary reporting systems, which complement mandatory systems (Kohn et al., 1999), are offered to freely and spontaneously share adverse event information where there are no pressures on the reporter from external authorities and the information remains confidential (White 2007). The primary application of voluntary

reporting typically regards errors that resulted in no harm to the patient, and their aim is to identify and remedy vulnerabilities in systems before harm can occur (Kohn et al. 1999, White, 2007).

The second type of systems are mandatory reporting systems that compel health professionals to report an error through policy, regulation, or legislation, the primary purpose of which is to hold health providers accountable (Kohn et al., 1999; White 2007). In contrast to voluntary reporting systems, mandatory reporting systems are often designed to track more egregious errors (White, 2007). Mandatory reporting systems provide the public with a minimal level of protection by assuring that the most serious errors are reported and investigated. They also provide an incentive to health care organizations to improve and invest in patient safety (Kohn et al., 1999).

Both voluntary and mandatory systems may be structured to be "anonymous" and/or "confidential" to protect the patient's information, the provider or both. Anonymous reporting systems exclude all patient and/or provider identifying information, whereas confidential reporting systems include the identifiable patient and care information to allow for follow-up or clarification (White, 2007). The personal details are stripped from the report for confidentiality once communication with the reporter is no longer required (White, 2007). Whether they are anonymous or confidential, mandatory and voluntary systems are all important to consider as factors that influence error reporting; this will be discussed in detail in the next section. Equally important is the form of reporting: paper or electronic.

A reporting system can involve paper or electronic forms; however, the key element to reporting is that regardless of method, it is consistently available and provides equal

opportunity for all to report the incident or event (White, 2007). Paper forms are not considered to be ideal for reporting. Paper forms take more time for processing (White, 2007), and there is a lack of feedback to employees after the report has been filed (Elliot et al., 2014). Along with the opportunity of misplacement of the form with the desk-to-desk flow of paper, the paper-based form is not ideal for confidentiality (Atherton, 2002; White, 2007), and there is also an issue with understanding the pertinent data when the handwriting is not entirely legible (White, 2007). To add, staff can be confused about which form to use, how to fill them out, and be confused about who is responsible for following up (Atherton, 2002). Unlike the electronic form, there is a lack of space on the paper-based form to provide all pertinent details (White, 2007).

Electronic reporting appears to be more efficient and be more beneficial than paper-based forms. The time required to track incidents and implement improvements to the reporting system can be reduced by 25-50% when moving from paper to electronic reporting (Atherton, 2002; White, 2007). Electronic forms also ensure that the reporter fills important mandatory information, which can be filled automatically or an automated prompt can require more information from the physician (White, 2007). Event Reporting Management Systems (ERMS) have been credited for making many improvements for patient safety, such as simplifying reporting, eliminating multiple forms, increasing quality and quantity of occurrence data, and improving response time (Avery et al., 2005). A study from Newfoundland and Labrador in which researchers conducted satisfaction surveys, interviews and focus groups with medical staff who have used electronic reporting systems found that 205 study respondents indicated an increase in reporting, improved management notification, and increased reporting of close calls or near misses (Elliot et al.,

2014). Other key benefits of the electronic reporting system include improved confidentiality, availability of status update information, less time to report the events, and more awareness of near-misses (Elliot et al., 2014). With all of the improvements to reporting using electronic forms, there are also some flaws in its design. The most predominant area for improvement for electronic reporting systems is the lack of follow-up action and feedback from supervisors following the report's submission (White, 2007; Elliot et al., 2014). Additionally, moving from paper to electronic reporting requires structured training to ensure the staff is confident using the reporting system (Gong et al., 2015).

Regardless of reporting method, the reporting system's ultimate goal is to analyze the information gathered, identify ways to prevent future errors from occurring, and finally, implement those preventative strategies and policies (Kohn et al., 1999).

Policies and Legislation Related to Reporting Errors and Adverse Events:

Health policy and law are important to consider with error reporting. Consistent policies, laws, and practices for reporting should assist physicians by providing a clear understanding of reporting expectations (McCartney, 2013). There has been limited work done on the specifics of legislation and institutional policies applicable to error reporting in Canada. The federal-level of Canadian regulations relating to reporting medical incidents included in both the Food and Drug Regulations (Food and Drug Regulations, CRC, c 870, ss C.01.017 to C.01.020, and C.01.051) and Medical Devices Regulations (Medical Devices Regulations, SOR/98-282, ss 59, 60, 63 and 64) only focus on the manufacturer role in reporting and does not include any information about the specific PSI or the physician or

healthcare provider role. For example, the Food and Drug Regulations stipulate that the drug manufacturer must prepare an annual summary report of the adverse and serious drug reactions during the previous 12 months (Food and Drug Regulations, CRC, c 870 ss C.01.018). The legal requirement for reporting errors or near misses currently varies across Canadian jurisdictions. Only four provinces have passed legislation that requires PSI reporting: Saskatchewan (SK) (The Regional Health Services Act, SS 2002, c R-8.2, s 58), Manitoba (MB) (The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4, 53.7 to 53.8, and 53.10;), Ontario (ON) (Excellent Care for All Act, 2010; Public Hospitals Act, RRO 1990, Reg 965, ss 1 and 2) and Québec (QC) (An Act Respecting Health Services and Social Services, RSQ, c S-4.2, ss 8, 12, 183.1, 183.2, 233.1, 235.1, and 431. Each province or territory provides its definitions, what they expect to be reported, how the event is reported, and to whom. (Baker et al., 2008; McCartney, 2013).

Saskatchewan Legislation and Regulations:

Saskatchewan was the first province to require reporting adverse events to its provincial Department of Health (Health Quality Ontario, 2017). Furthermore, the legislation in SK established a scheme for reporting and vital definitions of what needs to be reported (The Regional Health Services Act, SS 2002, c R-8.2, s 58.; Government of Saskatchewan). SK is the only province that has provided a semi-detailed guideline for reporting. The Saskatchewan Critical Incident Guideline (2004) (*see appendix B*) is a useful guide that all provinces could follow to ensure that all PSIs described in the guideline are being reported. Along with this guideline, SK legislation requires the investigation of PSIs, which they have defined as "critical incidents" (The Regional Health Services Act, SS 2002, c

R-8.2, s 58.). These "critical incidents" must be reported by the healthcare organization to the Minister of Health in SK (The Regional Health Services Act, SS 2002, c R-8.2, s 58.). Once the investigation of the PSI is concluded, the information gathered about the incident is protected in legal proceedings, in part, to encourage reporting (McCartney, 2013).

Manitoba Legislation and Regulations:

Legislation in Manitoba stipulates that the health organizations are responsible for writing their procedures for reporting "critical incidents" (The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4, 53.7 to 53.8, and 53.10.). If a PSI occurs during care, MB requires that after disclosure of the incident to the patient, a complete record be made about the facts of the PSI including the actions taken to address the consequences following the incident (The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4).

Furthermore, the regional health authority must be informed of the PSI and is tasked with informing the minister, then they must establish a critical incident review committee that performs an investigation and report about the incident (The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4). The report produced by the committee contains findings and recommendations, which is provided to the organization as well as the minister by the regional health authority (The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4)

Ontario Legislation and Regulations:

In Ontario, hospitals must be governed by a board that ensures that every "critical incident" is reported to an institutional medical advisory committee. Following a PSI, the

administrator to the board will ensure that the incident is analyzed and that a systemic plan is developed to reduce the risk of a similar PSI occurring (Public Hospitals Act, RRO 1990, Reg 965, ss 1 and 2.). Finally, the administrator must provide the data of the PSIs that occurred to the hospital's quality committee a least twice per year (Excellent Care for All Act, 2010; Public Hospitals Act, RRO 1990, Reg 965, ss 1 and 2).

Québec Legislation and Regulations:

The legislation in Québec states that healthcare institutions must create a risk management committee whose responsibility is to analyze the risk of 'incidents' or 'accidents', as well as establish a monitoring system, including the creation of a local register of incidents (An Act Respecting Health Services and Social Services, RSQ, c S-183.1). Following a PSI, the healthcare provider must report it to the executive director of the institution, the PSI will be reported on a form (An Act Respecting Health Services and Social Services, RSQ, c S-233.1). The Act does not specify which type of form (i.e., paper-based or electronic) will be used for reporting. Following the report's submission, the healthcare institution's board of directors must establish rules and measures to be followed to prevent the PSI from recurring (An Act Respecting Health Services and Social Services, RSQ, c S-235.1). Furthermore, Québec requires that every institution transmits an annual report of activities (including patient safety) to the Minister of health within three months of the fiscal year, who will determine priorities and implementation of objectives (An Act Respecting Health Services and Social Services, RSQ, c S-4.2, ss 233.1, 235.1, and 431.).

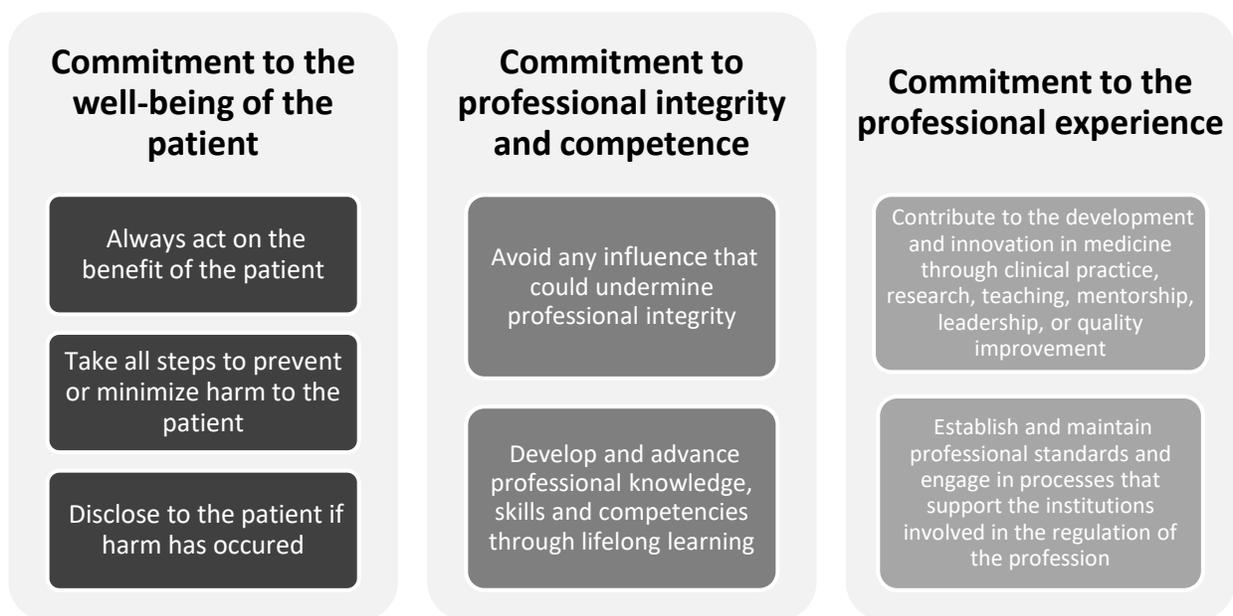
The four aforementioned provinces (SK, MB, ON & QC) use consistent language to describe medical errors or patient safety incidents; they are described as “critical incidents” (An Act Respecting Health Services and Social Services, RSQ, c S-183.1; Public Hospitals Act, RRO 1990, Reg 965, ss 1 and 2.; The Regional Health Services Act, SS 2002, c R-8.2, s 58.; The Regional Health Authorities Act, CCSM, c R34, ss 53.1 to 53.4, 53.7 to 53.8, and 53.10). Notably, they differ in reporting mechanisms as well as who the incident is reported to. For example, while in SK the incidents are to be reported to the minister of health, in MB, they are reported to the regional health authority, who then informs the minister of health. No policies act as barriers to reporting, however only four provinces in Canada have passed legislation in regards to PSI reporting. While these regulations and Acts require the health authority to report the critical incident, only QC has mentioned the role of the healthcare provider in the legislature. The physician and healthcare provider role are present in the undertone of the legislation; for the health authority and 'minister' to enact the measures following an error, it must first be reported.

Physician's Responsibility to Report

According to the Canadian Medical Association (CMA) (2018), "trust is the cornerstone of the patient-physician relationship and medical professionalism" (p.2). Physicians have an ethical responsibility to disclose as well as report PSIs. Failing to report or disclose harm directly violates the ethical principles of beneficence (doing good) and nonmaleficence (preventing harm) (Wolf & Hughes, 2008). It also violates the "do no harm" oath taken by practicing physicians. The original Hippocratic oath called for physicians to keep patients from harm and injustice (Edelstein, 1943). The oath reminds physicians to

accept their limitations, practice self-awareness and humility, as well as pursue lifelong learning to improve patient care and prevent illness (Antoniou et al., 2010). Physicians in Ontario are expected to consider patient needs before their own and must participate in self-regulation (CPSO, 2020). The CMA Code of Ethics (2018) informs ethical decision-making and provides the standard for ethical practice. The Code of Ethics helps to guide physicians in fulfilling their duty to provide the highest standard of care and to promote patient and public trust (CMA, 2018). *Figure 6* outlines the medical profession's fundamental commitments as described in the CMA Code of Ethics, which are pertinent to error disclosure and reporting.

Figure 6: Summary of the Commitments from the CMA Code of Ethics (CMA, 2018)



If a physician follows the CMA Code of Ethics to the letter, reporting and disclosure is an ethical obligation within the fundamental commitments to the patient, professional integrity, and professional experience. By accepting to commit to professional integrity and professional experience, the physician is also accepting the responsibility of self-regulation.

Advancing professional knowledge as well as maintaining professional standards will include self-regulation. Each physician must take responsibility for their actions and behaviour (CPSO, 2020). As outlined in the CPSO Practice Guide, self-regulation is meant to ensure the best quality care for patients by continually improving skills and behaviour, and responding to concerns around practice and behaviour (CPSO, 2020), including substance abuse, infectious diseases, any physical or mental conditions that could affect practice, as well as accurately reporting and disclosing an error to a patient (CPSO, 2020).

When a physician abuses alcohol and/or drugs, patient safety is at risk of serious harm, and relationships with colleagues are compromised (Russel, 2021). Acknowledging the problem and seeking help can be more troublesome for physicians since they are presumed to be educated on the harmful effects of substance abuse (Russel, 2021). It is stated in the CMA Code of Ethics that although physicians should avoid damaging the reputation of colleagues, they must report any unprofessional conduct to the appropriate authority (CMA, 2018). Some provincial regulatory colleges also have information to help guide physicians' responses and interactions with an impaired colleague. For example, the CPSO policies state that physicians must take action when they have reason to believe that another physician is incompetent or incapacitated and is putting their patient at risk (CPSO, 2017). However, the CPSO does not indicate a duty to report as clearly as the College of Physicians and Surgeons of Alberta (CPSA). The CPSA has clear policies that state the duty to report a colleague (CPSA, 2020a) and the duty to self-report (CPSA, 2020b). The CPSA stipulates that the physician must report if they or their colleagues "presently has a physical, cognitive, mental and/or emotional condition that negatively impacts or is likely to negatively impact their work" (CPSA, 2020a, para. 3; CPSA, 2020b, para. 3). However, in

a study conducted among 75 physicians, physician's likelihood of self-reporting and peer-reporting was 48% and 30% (Rishoej et al., 2018). Furthermore, a study conducted by Mahdaviyazad et al. (2020) revealed that physicians are more likely to give their peers a verbal warning to than to report their colleagues' errors. If the physician knowingly fails to report a colleague, they could be subject to disciplinary proceedings, especially if a patient was harmed (CMPA, 2016). Reporting helps institutions and provincial and territorial healthcare departments identify PSI trends and subsequently improve patient safety (CMPA, 2015). It is undeniably the physician's responsibility to report medical errors made by themselves or colleagues. Furthermore, the physician must determine if they have a legal obligation and ethical duty to make a report to their institution, governing college, and/or public health officials and do so promptly to reduce risk to patients (CMPA, 2016).

Disclosure of PSI's is not only a statement of a mistake, but it is also another type of error reporting made to the patient (Wolf & Hughes, 2008). Honesty is important for the patient-physician relationship. Disclosure of harm not only conforms to the CMA Code of Ethics and legal obligations but also upholds the integrity of the relationship with the patient (CPSO, 2020; Rodriguez et al., 2009). Disclosure is the practice of communicating the facts of the PSI to the patient by the physician (McCartney, 2013). It acknowledges the incident and informs the patient; withholding vital information from the patient about their medical condition interferes with their ability to make informed decisions about future treatment (Rodriguez, 2009). Disclosure and apology can help alleviate the feelings of failure and guilt that can affect the physician following an error (CPSO, 2020). The physician must disclose directly to the patient unless the patient is incapacitated or deceased whereby physician must then disclose the error to the patient's trustee (CPSO,

2019). The facts and description of the cause of the incident, the consequences, and the actions taken to address the consequences must be included as part of disclosure to the patient and reflected in the patient's medical record (CPSO, 2019). Patients deserve to know about the state of their health and withholding information that could further harm the patient is morally unethical. Many factors could influence physician error reporting, and these will be explored further in the following section.

Factors that Influence Physician Error Behaviour

This section addresses the final research question: What are the factors that influence physician clinical error reporting behaviours? Various factors are explained through the lens of the Theory of Planned Behaviour (TPB) (*Figure 2*). As previously discussed, the TPB suggests that three constructs determine the physician's intention to engage in reporting behaviour: attitude toward the behaviour, subjective norms, and perceived behavioural control. The predominant factors that were identified in the literature are: (i) reporting system and process (ii) psychological safety, (ii) manager and supervisor support, (iv) feedback for patient safety improvement (v) teamwork and peer support, as well as (vi) lack of time.

Error reporting is important to increasing patient safety. Without proper reporting, the same errors can occur many times in different settings, and patients continue to be injured by preventable errors (Poorolajal et al., 2015). Error reporting relies on a professional culture in which physicians perceive reporting as an essential part of learning and patient safety improvement (Kaldjian et al., 2008). Further knowledge of what enables and hinders reporting could ultimately result in improved patient safety. Since error reporting systems rely on self-reporting and peer-reporting, it is important to understand these enablers and inhibitors (Kaldjian et al., 2008). Interestingly, physician gender, race, department, or years of experience do not influence physician error reporting behaviour (Appelbaum et al., 2018; Castel et al., 2015; Rishoej et al., 2018). Nevertheless, many factors have been identified that do affect physician error reporting.

Reporting System and Process

In the previous section, the structure of reporting mechanisms was discussed in detail. Now, the factors associated to the reporting system and how it influences behaviour will be addressed. Reporting systems are supposed to detect patient safety concerns and incidents and are intended to facilitate communication, learning, and overall improvement through the analysis of reports (CPSI, 2020; Gong et al., 2015; Kohn et al., 1999; White, 2007). When properly used, mandatory and voluntary reporting systems permit gathering and grouping of data to determine patient safety incident patterns, leading to corrective action and learning (Hewitt et al., 2017). Despite their purpose, incident reporting systems are often described as a source of frustration and many have questioned their efficiency (Hewitt et al., 2017).

Attitude Toward the Behaviour – Reporting Systems and Process

The perceived efficiency of reporting systems can either serve as an enabler or inhibitor to physician error reporting. This depends on the belief of the physician; whether reporting will produce a desired or undesired outcome. Various studies have offered insight into physicians' beliefs on the subject (Butt, 2010; Hartnell et al., 2012; Hewitt et al., 2017; Kaldjian et al., 2008; Kreckler et al., 2009; Pfeiffer et al., 2013). As such, if the physician perceives that reporting an error will make a difference, this serves as an enabler to reporting. According to Rishoej et al. (2018), if a physician believes that lessons can be learned to reduce repeated errors and patient injuries, this functions as an enabler to error reporting behaviour. To add, in a study conducted among 338 physicians, 84.3% of respondents agreed that reporting errors can ameliorate the quality of care for future

patients (Kaldjian et al., 2008). On the other hand, many physicians carry the belief that errors are inevitable and reporting is unnecessary (Butt, 2010). Some physicians believe that reporting is only used as a gauge of incompetence and is overtly bureaucratic (Hewitt et al., 2017). These types of beliefs create a barrier to reporting grounded in a negative attitude towards the reporting system. The perceived usefulness of the reporting system has been proven to affect reporting intention (Wu et al., 2008). In a study among 230 physicians, the degree to which respondents believed that reporting made a difference in patient safety was a strong antecedent and was one of the most relevant personal influences on the willingness to report (Pfeiffer et al., 2013). In accordance, research published by Health Quality Ontario (2017) concurred that the perception that incident reporting does not improve patient safety was a commonly expressed barrier to reporting.

If physicians perceive that they are making a positive difference by reporting, this can increase the likelihood that they will report errors. For example, patient protection is considered an incentive to reporting, physicians who perceive that reporting the error can benefit the patient and improve patient care are more likely to follow through on reporting behaviour (Hartnell et al., 2012; Hewitt et al., 2017). In different circumstances, physicians attribute a negative significance to reporting. This can be seen when physicians lack trust in the system (Poorolajal et al., 2015). Namely, physicians opposed to mandatory reporting systems have argued that the anonymity of reporters may not be protected, which increases reluctance to report (Butt, 2010).

Subjective Norm – Reporting Systems and Process

Subjective norm is the most significant antecedent for reporting system success (Wu et al., 2008). The supporting culture of the physician's responsibility to report is another factor to consider for reporting behaviour. For instance, an inhibitor to peer-reporting was the physician's perception that reporting a colleague's error was outside of their locus of responsibility (Hewitt et al., 2017; Rishoej et al., 2018). Physicians prefer encouraging their colleagues to self-report instead of peer-reporting (Rishoej et al., 2018). To add, a study by Machen et al. (2019) revealed that doctors were less likely to report errors as they perceived medication safety as part of a nurse's role. This belief was likely created by the reporting culture of the institution. Within medicine, new physicians start with little knowledge of error reporting and typically pick up 'bad habits' as they are exposed to prevalent informal practices (Machen et al., 2019). Reporting can be influenced by the social networks, attitudes, and practices within the organizational setting and new physicians revealed a pressure to conform to those established norms (Machen et al., 2019).

Perceived Behavioural Control – Reporting Systems and Process

The submission of an error report highly depends on the physician's ability to use the reporting system. Lack of knowledge on what to report was a frequently cited barrier to reporting (Health Quality Ontario, 2017; Kaldjian et al., 2008; Levinson, 2012; Machen et al., 2019; Wolf & Hughes, 2008). Lack of knowledge could both prevent physicians from reporting important errors and lead to unnecessary reporting of irrelevant incidents (Rishoej et al., 2018). For instance, in a study that reviewed 302 events, it was revealed that

hospital staff did not report 86% of PSI's (n=253) to the reporting system due to misperception about what constitutes patient harm and error (Levinson, 2012), which can, in part, be attributed to the varying definitions of what constitutes error (Wolf & Hughes, 2008). Many physicians have expressed that variable understanding of the definition of error is a barrier to reporting (Health Quality Ontario, 2017; Levinson, 2012; Mahajan, 2010). Furthermore, in a study conducted among 338 physicians, only 39.5% of respondents (n=133) knew what kind of errors should be reported (Kaldjian et al., 2008). In another study of 87 physicians, 49.4% had a poor knowledge level of medical errors, and 44.7% did not know the definitions or classifications of error (Mahdaviazad et al., 2020)

For physicians to effectively report errors in medicine, they must know how to use the reporting system in place. A study of 230 physicians found that the most influential factor on willingness to report was the physician's capability to use the reporting system (Pfeiffer et al., 2013). The study by Kaldjian et al. (2008) revealed that only 54.8% of respondents knew how to report errors to their institution and when respondents knew how to report errors, they were two to three times more likely to report the error. Also, uncertainty about how to report mistakes impede transparency and reporting among physicians, and intuitive guidelines could facilitate physician error reporting (Perez et al., 2014; Poorolajal et al., 2015). An example of an intuitive guideline can be found in *Appendix B*, the Saskatchewan Critical Incident Reporting Guideline (2004). Kaldjian et al. (2008) noted an interesting discrepancy between physicians' intentions to report and actual error reporting behaviours; while physicians are generally willing to report, few perform the behaviour due to their lack of knowledge or understanding of the reporting process. An important step to improve patient safety includes curriculum changes, education and

training to build competencies around error definitions and reporting systems (McLennan, 2018; Mahdaviadzad et al., 2020). Results found by Mahdaviadzad et al. (2020) illustrated that 58.6% of physicians did not receive training about medical errors, and 73.6% did not receive training about the use of the reporting system. To create the necessary safety culture of reporting, physicians must possess the knowledge and skillset to report errors confidently and feel safe in their environment.

Psychological Safety

If we want physicians to report errors, they must feel safe in their environment. Safety culture can be defined as “the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organizations health and safety management” (Abstoss et al., 2011, p.914). The current culture of blame and shame strongly contributes to underreporting (Butt, 2010). Punitive responses to errors have led to the hiding of errors (Abstoss et al., 2011). An error can cause emotional, mental, and/or social effects on all involved, and physicians can be considered as ‘second victims’ of PSIs (CIHI, 2016; Van Gervan et al., 2016). As a second victim, physicians can experience a varying sense of inadequacy (Bari et al., 2016), anxiety, depression (de Oliveira et al., 2013; Van Gervan et al., 2016), loss of clinical confidence, disappointment, fear of retribution and liability, anger, suicidal ideations, insomnia (Rodziewicz & Hipskind, 2019), and guilt (Bari et al., 2016; Rodziewicz & Hipskind, 2019; Van Gervan et al., 2016). A large study of 6586 practicing physicians indicated that 691 (10.5%) reported perceiving having made a medical error within the previous three months, and the physicians who reported errors had a higher

incidence of burnout (77.6%) than those who did not (51.5%) (Tawfik et al., 2018). Also, 46.6% of physicians who had made an error reported high levels of fatigue, and 12.7% had recent suicidal ideations (Tawfik et al., 2018). It is estimated that the likelihood of physicians becoming a second victim within the course of their career can vary between 10-50% (Van Gervan et al., 2016).

As previously discussed, physicians typically take the Hippocratic Oath and commit to keep patients from injustice and “first, do no harm” (Edelstein, 1943). However, as noted by Perez et al. (2014), this oath may have created unintended consequences. While it intended to remind physicians not to add to patient suffering, it also established a precedent for physicians that error is prohibited or makes them a bad doctor (Perez et al., 2014). Now, in the “culture of blame”, physicians can feel different types of fear related to reporting errors. Following an error, punishments can include entering the error into the physician’s employee file, receiving a written consultancy, as well as having their employment contract cancelled (Soydemir et al., 2017). In an environment where there is psychological safety, physicians are more likely to report; psychological safety has been identified as an important antecedent to physician intention of reporting (Appelbaum et al., 2016). A climate of psychological safety can be described as physicians’ shared perception about the consequences of taking risks in their work environment, such as asking questions or reporting an error (Naveh & Katz-Navon, 2014). In a state of psychological safety, physicians do not feel inhibited by the possibility of others’ disapproval or potential negative consequences following a behaviour (Naveh & Katz-Navon, 2014). Therefore, a culture of psychological safety is important for error reporting behaviour.

Attitude Toward the Behaviour – Psychological Safety

Fear is a negative emotional reaction. As such, if a person is afraid of the outcomes of performing a certain behaviour, it is less likely that they will do it. In regards to physician error reporting, fear is one of the most referenced barriers (Appelbaum et al., 2016; Butt, 2010; Denny, 2017; Health Quality Ontario, 2017; Holmström et al., 2015; Hewitt et al., 2017; Kaldjian et al., 2008; Machen et al., 2019; Mahdaviazad et al., 2020; Naveh & Katz-Navon, 2014; Pfeiffer et al., 2013; Poorolajal et al., 2015; Wolf & Hughes, 2008; Zabari & Southern, 2018). Physicians who lack trust in the reporting system tend to have more significant fears associated with reporting errors (Garbutt et al., 2008). Trust in the system has been shown to affect behavioural intention; physicians are often concerned about the level of security when they provide sensitive information (Wu et al., 2008). Moreover, physicians have voiced concerns about confidentiality and legal discoverability of error information that they report (Garbutt et al., 2008). These concerns are plausible given that malpractice and negligence claims can arise following an error; as a result, fear of litigation is cited by many studies on the topic (Hartnell et al., 2012; Health Quality Ontario, 2017; Machen et al., 2019; Mahdaviazad et al., 2020; Naveh & Katz-Navon, 2014; Pfeiffer et al., 2013; Poorolajal et al., 2015). A study conducted among 69 physicians by Poorolajal et al. (2015), revealed that 49% of respondents underreported due to fear of legal consequences. On the other hand, provider protection and immunity from lawsuits was an incentive to reporting (Hartnell et al., 2012). In *Appendix C*, a more detailed list of works can be found which cites the different types of fears; fear of litigation, fear of retribution, fear of blame, fear of appearing incompetent, and fear for reputation/job.

The fear of retribution is an obstacle to reporting (Abstoss et al., 2011; Appelbaum et al., 2016; Crane et al., 2015; Rishoej et al., 2018; Rubin et al., 2019; Zabari & Southern, 2018). Thirty-eight percent of (n=26) physicians cited being afraid of punitive action or fearing professional discipline (Poorolajal et al., 2015). Physician's perception about how these reported data will be used may influence these fears (Denny et al., 2017). If reporting is seen as unfairly punitive, physicians will be reluctant to comply with submitting the report (Naveh & Katz-Navon, 2014). On the other hand, non-punitive response to error has been positively associated with a higher frequency of error reporting (Richter et al., 2014). Next, fear of blame and shame is an important aspect from the physician's perspective (Health Quality Ontario, 2017; Hewitt et al., 2017; Mahdaviazad et al., 2020; Naveh & Katz-Navon, 2014; Scott & Henneman, 2017; Soydemir et al., 2017). In a culture of blame, physicians are perceived to be individually responsible for their errors (Naveh & Katz-Navon, 2014). When blame is frequently assigned for negative patient outcomes or errors, the error becomes personalized, and physicians form a negative relationship with reporting (Soydemir et al., 2017).

When an environment does not foster psychological safety, the physician can fear appearing incompetent (Appelbaum et al., 2016; Folligah, 2018; Hartnell et al., 2012; Lee et al., 2015; Pfeiffer et al., 2013), which can come full circle since the fear of being labelled incompetent or disruptive in the workplace by colleagues or staff can create an environment of low psychological safety (Appelbaum et al., 2016). When physicians personalize a PSI and frame it as a matter of incompetence and personal failure, this discourages error reporting (Hewitt et al., 2017). The label of incompetence can threaten the physician's professional identity (Hartnell et al., 2012), and could lead to the physician

lacking trust in their capabilities as well as colleagues' diminished trust in the reporter who made the error (Hewitt et al., 2017). In a qualitative study conducted at a hospital in Ontario, one resident stated, "I think the perception is that when you report errors it's not just the error that gets reported it's the person who made the error." (Hewitt et al., 2017, p. 132). So, an enemy of good reporting practices is not only what the physicians think of themselves, but also how they think their colleagues will perceive them (Hewitt et al., 2017). Physicians' fear for one's reputation and job are prominent in the literature (Jahromi, Parandavar, & Rahmanian, 2014; Machen et al., 2019; Poorolajal et al., 2015; Wu et al., 2013; Zabari & Southern, 2018). Many physicians fear 'looking like an idiot' (p.132) or a 'screw up' (p.132), which is indicative of how physicians tend to personalize PSIs (Hewitt et al., 2017). Tainting their professional reputation can also include the fear of losing their job or impeding career progression (Machen et al., 2019). Physicians are more reluctant to report if it is viewed as an impediment to career growth, especially when they feel the need to impress those who make decisions about opportunities for advancement and development (Hewitt et al., 2017). Notably, 48,1% of physicians (n= 33) expressed fear of losing their job after reporting (Poorolajal et al., 2015).

Additionally, physicians can have feelings of guilt and shame after making an error. Feelings of guilt following an error may be linked to the mindset that automatically interprets bad outcomes as failures (Kaldjian et al., 2008). There is also a connection between forgiveness and willingness to report. Physicians who believe that forgiveness is important are twice as likely to report errors (Kaldjian et al., 2008). In an environment where remaining silent about errors is normal, physicians are less able to cope with their

errors and have higher feelings of shame than physicians who can speak openly about their errors (May & Plews-Ogan, 2012).

Subjective Norm – Psychological Safety

Physicians have historically responded to an error with self-doubt, self-blame, shame, and fear; this has led to a norm of silence in healthcare (Wolf & Hughes, 2008; Perez et al., 2014). Interestingly, studies have shown that Canadian and American physicians share very similar attitudes and experiences related to error, despite very different healthcare structures and malpractice environments (McLennan, 2018), which implies that similar beliefs and experiences must relate to the norms, practices, and values that form the culture in medicine (McLennan, 2018). Traditional medical education stresses the importance of error-free practice and uses peer-pressure to accomplish ‘perfection’ (O’Daniel & Rosenstein, 2008). Thus, medical errors are perceived as a failure (O’Daniel & Rosenstein, 2008) resulting in a culture that does not openly accept such events (Plews-Ogan et al., 2016). This type of culture, coupled with shame and guilt has often caused physicians to carry a silent, dissociative narrative about their errors (Plews-Ogan et al., 2016), which can limit error reporting. To add, hospitals that have a blame culture, with a punitive response to error, have poorer reporting and learning across the organization (Machen et al., 2019). This blame culture, comprised of frequent firing and suspensions, tends to manifest a lack of support from colleagues and a tacit acceptance of underreporting (Pfeiffer et al., 2013; Wu et al., 2013). In like manner, this culture fosters the ‘second victim’ symptoms such as blame, silence, and seclusion that physicians can experience following an error (Pratt & Jachna, 2015).

Despite increased awareness of physician distress following an error, they often cope with error in silence (May & Plews-Ogan, 2012). As such, fear of being singled out discourages error reporting practices (Butt, 2010). Physicians have cited being shamed by colleagues by being categorized as a 'whistle-blower' (Soydemir et al., 2017), or a 'wrong-doer' (Yarmohammadian et al., 2014). Additionally, silence from colleagues and supervisors can lead to varying degrees of disappointment and isolation (May & Plews-Ogan, 2012). In that silence, physicians can feel alone in their mistake, left with a sense that no one cares (Plews-Ogan et al., 2016). The sense of seclusion and loneliness are often exacerbated when colleagues avoid them due to their discomfort (Pratt & Jachna, 2015). In contrast, if physicians feel more attached to their hospital and team and feel like it is a safe environment, they have fewer fears toward reporting (Pfeiffer et al., 2013). Managers and supervisors can foster a safe environment and just culture.

Manager and Supervisor Support

Management and leadership in institutions have the power to influence the safety culture among their staff. So, managers must assume the responsibility for patient safety by visibly supporting reporting and learning from error (Denny, 2017). Those in a leadership role should set the tone by establishing and obeying the behavioural standards that support reporting standards in their organization (O'Daniel & Rosenstein, 2008). If managers do not support error reporting, this can hinder physician error reporting. Managers should create initiatives to increase error reporting and support psychological safety; this can be done by communicating the process and providing safeguards to avoid punitive actions following an error (Appelbaum et al., 2016). Leaders must acknowledge

physician perceptions and make patient safety and organizational learning a priority (Richter et al., 2015). This is imperative since, in some cases, reporting is discouraged by administration, and physicians can be concerned about managers interfering in the regulation of quality of care (Butt, 2010).

Attitude Toward the Behaviour - Manager and Supervisor Support

Physicians in numerous studies have acknowledged that management support greatly influences their willingness to report errors (Health Quality Ontario, 2017; Naveh & Katz-Navon, 2014; Soydemir et al., 2017; Wolf & Hughes, 2008; Zabari & Southern, 2018). Appropriate leader support can reduce perceived negative consequences attributed to error reporting (Appelbaum et al., 2016). Studies have shown a higher frequency of reporting if physicians perceived their manager as enhancing patient safety and fostering reporting (Richter et al., 2015; Pfeiffer et al., 2010). To add, management support can directly affect the perceived usefulness, perceived ease of use, and subjective norm (Wu et al., 2008). Leaders who fail to support and safeguard reporters from punitive action can reinforce physicians' fear of retribution (Wolf & Hughes, 2008). For example, a study conducted by May & Plews-Ogan (2012) found that a physician who had misdiagnosed a patient resulting in a lawsuit felt abandoned by the supervisor when he had not discussed the error with the supervisor at all. By leaving the physician in silence, the supervisor left the physician with a sense that no one cared or that peers thought they were a failure (May & Plews-Ogan, 2012). In an environment where the leader is non-judgemental, supportive, and frames errors as a learning opportunity, physicians are more likely to engage in error reporting behaviour (Zabari & Southern, 2018).

The physician's perception of management's open-mindedness is dependent on whether management explicitly displays availability, accessibility, openness, and acknowledgment of physician contribution (Appelbaum et al., 2016). A favourable environment is one where managers are perceived as willing to listen and support; when this is not the case, physicians believe that they cannot freely express themselves, which leads to fears that cause them to avoid expressing their opinions and concerns (Naveh & Katz-Navon, 2014). Physicians are less likely to use the reporting system if they notice that the manager creates a threatening environment by treating staff disrespectfully or provokes a sense of vulnerability in physicians (Zabari & Southern, 2018). In that case, the manager creates a culture of organizational silence, where speaking up is not worth the effort, and voicing opinions or concerns is dangerous (Naveh & Katz-Navon, 2014). On the other hand, managers can support psychological safety by being accessible, approachable, and mediating conflict (Zabari & Southern, 2018). Leader inclusiveness can positively influence psychological safety, which predicts physician reporting intentions (Appelbaum et al., 2016; Carmeli et al., 2010; Hirak et al., 2012).

Subjective Norm - Manager and Supervisor Support

A leader has the power to positively or negatively influence physicians' psychological safety by positively shaping safety culture (Appelbaum et al., 2016). Managers should promote the use of the reporting system while emphasizing that there will be no punitive action or blame; if managers show that they are happy to see the use of the reporting system, physicians are more likely to use it (Wu et al., 2008). Management support is an important factor that directly affects the subjective norm (Wu et al., 2008).

Norms of openness and participatory leadership impact patient safety culture and subsequently error reporting (Denny, 2017). In a study conducted among 230 physicians, one of the strongest antecedents to reporting was how much they thought their leaders expect them to report (Pfeiffer et al., 2013). Thus, strong management support represents a component to a more conducive environment to error reporting and learning.

Feedback for Patient Safety Improvement

Reporting alone does not increase patient safety. Physicians can report their errors, but safety will not improve unless reporting is followed by implementation of change and action (Naveh & Katz-Navon, 2014). The goal of feedback is to learn from mistakes and improve systems and practices (Health Quality Ontario, 2017). The reporting system's effectiveness depends on whether the department and physicians learned lessons from the incident in a balanced and timely manner (Health Quality Ontario, 2017). A study conducted among 28 363 physicians revealed that error feedback was the strongest positive influence on reporting, followed by organizational learning, which indicates that physicians want to see their error reporting taken seriously by management for future changes (Richter et al., 2015). Management should handle all reports seriously and exhibit a commitment to learning from errors; providing regular and timely error feedback is one way to achieve that goal (Health Quality Ontario, 2017; Richter et al., 2015). Leadership must be committed to making changes using error reports thereby demonstrating to physicians that reporting makes a difference (Richter et al., 2015).

Attitude Toward the Behaviour – Feedback for Patient Safety Improvement

Error feedback is a heavily cited factor that influences error reporting (Kaldjian et al., 2008; Mahdaviyazad et al., 2020; Mahajan, 2010; Pooprolajal et al., 2015; Richter et al., 2015; Soydemir et al., 2017). Error feedback has been shown to have a positive effect on reporting. A study conducted among 338 physicians revealed that 47.9% of respondents were more likely to report if they anticipate receiving feedback (Kaldjian et al. 2008). A key driver of physician willingness to report was the confidence that improvements will be made using the reported errors (Garbutt et al., 2008). Learning is enabling to reporting, learning from your errors moulds it as part of a larger goal and frames it as a method of improvement (Hewitt et al., 2017). For some physicians, a positive response to their error was understanding what happened and solving the problem so it would not reoccur (Plews-Ogan et al., 2016). They can find meaning in their errors by implementing change to increase patient safety themselves (Plews-Ogan et al., 2016). Figuring out what happened and helping to develop system changes for error prevention was the first positive response to error and the best step for taking responsibility (Plews-Ogan et al., 2016). Physicians who have encountered error can be the most motivated and devoted patient safety advocates and teachers (Ring et al., 2010). However, if physicians perceive that managers will not act on the submitted reports and cannot see measurable change as an outcome to reporting, they are more reluctant to report an error (Mahajan, 2010). In fact, in a study conducted among 186 physicians, 57.7% (n=107) agreed that lack of feedback was a barrier to reporting errors (Mahajan, 2010). In some cases, lack of feedback made physicians feel as though management did not respect them or their time (Soydemir et al., 2017). At the same time, if feedback was received but it was negative and criticizing, this

served as a deterrent to future reporting (Soydemir et al., 2017). All in all, there has to be an apparent benefit to physicians based on the actions taken in response to the errors reported.

Teamwork and Peer Support

A team can be defined as two or more people with specific roles who interact interdependently, adaptively, and enthusiastically towards the same goal (O'Leary et al., 2012). Teamwork is accomplished when all physicians work toward a common aim or goal and work together to achieve that aim (O'Daniel & Rosenstein, 2008). Some components of successful teamwork can include: open communication, shared responsibility, nonpunitive treatment, enabling environment, and clear specifications regarding accountability (O'Daniel & Rosenstein, 2008). In this case, effective teamwork is essential to achieve the goal of increased patient safety. Teamwork has been positively associated with a higher occurrence of error reporting behaviours (Richter et al., 2015). A strong and open team can also mean that there is a better peer-support system in place.

As previously stated, physicians are susceptible to developing emotional distress and burnout following error (Hu et al., 2012). This distress can impact performance and increase medical errors (Parks-Savage et al., 2018; Van Gervan et al., 2016; Welp et al., 2015). To aid with this distress, physicians may seek support from peers, colleagues, family, or friends; but many are unsure of whom to confide in about the error (Pratt & Jachna, 2015). A study conducted among 106 physicians revealed that the most commonly identified potential sources of support at their institution was colleagues (70%), residents (61%), program directors (56%), as well as chief residents (51%) (Hu et al., 2012). Interestingly, ER physicians were less likely to seek support following an error (48%)

compared to surgeons (62%), and anesthesiologists (77%) (Hu et al., 2012). Now, promising efforts like peer support programs are being created and more attention is focusing on a 'culture of safety' which could improve reporting practices following an error (May & Plews-Ogan, 2012).

Attitude Toward the Behaviour - Teamwork and Peer Support

Effective teamwork stimulates an environment of psychological safety (Lovell et al., 2012; Welp et al., 2015). As previously discussed, psychological safety positively influences error reporting behaviours. Unfortunately, many physicians can become accustomed to poor communication and teamwork, and as a result, a culture of low expectations could be created in the health care setting (O'Daniel & Rosenstein, 2008). Teamwork and relationships between colleagues can have a powerful influence on the communication of important information, and delays in this communication can hinder the quality of patient safety (O'Daniel & Rosenstein, 2008). A lack of cooperation and teamwork is not conducive to a culture that enables reporting (Denny, 2017). On the other hand, interviews with 61 physicians who had made a serious error revealed that working as a team to prevent and respond to errors is very important (Plews-Ogan et al., 2016). The sense of teamwork can improve when staff feel supported by their colleagues when reporting errors, enabling learning from each other's errors (Abstoss et al., 2011).

The lack of peer support is another barrier to error reporting (Poorolajal et al., 2015; Wu et al., 2013; Zabari & Southern, 2018). The psychological trauma prompted by error can be exacerbated by critical or hurtful responses from peers (Wu et al., 2013). Research has shown that a physician's willingness to report increases if they believe that

error reporting will not be met with retaliation from peers (Perez et al., 2014). There are many conversations that physicians can find helpful in coping with the aftermath of their error (May & Plews-Ogan, 2012). One physician in a study by Zabari & Southern (2018) shared a story where he received a call from a senior physician who had made a similar error; this type of support was tremendously helpful for dealing with his grief and embarrassment and had a positive influence on his willingness to report in the future. The most important and impactful conversations are those with colleagues that result in learning by sharing their story (May & Plews-Ogan, 2012). On the contrary, physicians are less likely to report if they feel like they lack close relationships with their colleagues or feel in competition with them (Zabari & Southern, 2018). Some physicians feel as though they have no one to talk to about the error or even face silence from their peers, which can lead to a sense of isolation (May & Plews-Ogan, 2012). To add, some conversations with well-intentioned peers can be unhelpful; physicians can feel as though their trauma is being minimized or that their friends are trying to protect them (May & Plews-Ogan, 2012). The impulse of well-intentioned colleagues to solve the problem or who minimize the error can prevent physicians from receiving the perspective needed to overcome the trauma of error (Plews-Ogan et al., 2016).

Most physicians believe that talking to a colleague about error is beneficial (Pratt & Jachna, 2015). In a study by Plews-Ogan et al. (2016), physicians wanted “a peer and an ear” (p.238); they wanted to be able to discuss error openly with a supportive colleague, which can be achieved with peer support programs. Well-designed peer support programs can provide physicians with the chance to share their stories with understanding colleagues, who offer unique insight and empathetic ear (Pratt & Jachna, 2015). These

programs can be beneficial to error reporting since colleagues who are trained to make space for feelings are more likely to help a colleague cope with the error (Plews-Ogan et al., 2016). Peers who listen, acknowledge the severity of the situation, and help with perspective are the most beneficial for the second victim (Plews-Ogan et al., 2016). In addition to helping with coping with the consequences of error, peer support groups can help build transparency while creating an open and non-judgemental environment (Perez et al., 2014).

Subjective Norm - Teamwork and Peer Support

When errors occur, physicians carry the personal burden of the consequences that follow as well as a reluctance to share these events; this reluctance is dictated by group norms and culture (Bognar, 2008). Settings with a more collegial and teamwork culture have lower error rates, and physicians are more likely to participate in patient safety standards like reporting (Machen et al., 2019). The likelihood of reporting can be shaped by group norms, values, and perceived behavioural regularities in the organization (Denny, 2017). The lack of cooperation, teamwork, learning, and physician empowerment are all associated with a culture that is not conducive to reporting (Denny, 2017). Additionally, physicians are less likely to report errors if cliques, judgment, and gossip are common in these environments (Zabari & Southern, 2018). If the institution's social norm is dictated by peers who shame, ignore, or are competitive with each other, this creates a barrier to reporting (Soydemir et al., 2017).

In some settings, the norm has labelled peer-reporting as tattle-tailing or whistleblowing (Hewitt et al., 2017; Perez et al., 2014; Rishoej et al., 2018). Whistleblowing

can be defined as “a person who raises concern about wrongdoing” (Bolsin et al., 2011, p.278). In a study of 107 physicians, 40% (n=43) of respondents expressed that it was not their responsibility to report their colleagues’ errors as it was perceived as whistleblowing (Alsafi et al., 2011). Further research on whistleblowing has shown that one-third of physicians are not willing to report incompetent colleagues because they want to preserve their friendships (Perez et al., 2014). The fact that physicians often seek moral support from their peers following error could indicate why whistleblowing is not socially acceptable (Perez et al., 2014). The negative connotation of ‘tattle tailing’ can also generate reluctance to report (Hewitt et al., 2017). By framing error reporting behaviours in a negative light, it implies that reporting violates social conventions and should be avoided (Hewitt et al., 2017). While peer-reporting faces powerful group norms against tattling and can undermine the sense of camaraderie among peers, physicians’ reluctance to report their colleagues’ errors endangers patient safety (Hewitt et al., 2017; Perez et al., 2014). This negative view of reporting can also promote bad behaviour while training residents and medical students (Bolsin et al., 2011). Consequently, one study revealed that of 111 medical students, 13% of them would report a senior colleagues’ error, but by the end of their medical training, only 5% agreed that they would report it (Bolsin et al., 2011). Thus, the group norm can not only hinder error reporting but also craft bad behaviours in new physicians.

Lack of Time

The typical physician's work-life balance can be shaped by many elements which include workload, sleep patterns, personality, challenging situations, practice specialty, and setting, etc. (Puddester et al., 2009). The Canadian Medical Association (2019c) conducted the CMA Physician Workforce Survey among 6405 family and general physicians. *Table 3* provides an adaptation of the results from the survey.

Table 3: Average Weekly Hours of General Physicians in Canada (CMA, 2019c)

Activity/Task	# of hours/ week
Direct patient care without a teaching component, regardless of setting	25.54
Direct patient care with a teaching component, regardless of setting	6.19
Teaching/Education without direct patient care (contact with students/residents, preparation, marking, evaluations, etc.)	1.35
Indirect patient care (charting, reports, phone calls, meeting patients' family, etc.)	7.26
Health facility committees (academic planning committees)	0.96
Administration (i.e., management of university program, chief of staff, department head, Ministry of Health, etc)	2.62
Research (including management of research and publications)	1.27
Practice management (staff, facility, equipment, etc.)	1.44
Continuing medical education/professional development (courses, reading, videos, tapes, seminars, etc.)	2.39
Other	0.54
Total	49.54

These results did not include on-call activities where 69% of physicians provided on-call services (CMA, 2019a) for an average of 107.7 hours per month (CMA, 2019b).

Canadian surveys have already shown that physicians believe their workload is too heavy

(Puddester et al., 2009). The medical profession is demanding, many challenges can arise from constant exposure to long hours, time pressures, physical and mental demands, suffering, as well as heavy workloads (Puddester et al., 2009). Physicians have even said that they lack the time to stop and eat due to their workload (Haw et al., 2014; Puddester et al., 2009). They struggle with the amount of control they have over their time (Konrad et al., 2010). So, if physicians barely have time to eat and maintain their work-life balance, it could be difficult to make time in their day to engage in error reporting behaviours.

Attitude Toward the Behaviour - Lack of Time

In some cases, the way physicians perceive errors and adverse events can influence whether they believe reporting is worthwhile; physicians believe that error reporting is not worth their time (Kaldjian et al., 2008). Some physicians tend to have a negative perception regarding error procedures (Naveh & Katz-Navon, 2014). If they believe that reporting procedures interfere with daily work and that investing their already coveted time to reporting is a waste of resources, they are less likely to report errors (Haw et al., 2014; Naveh & Katz-Navon, 2014). If the error reporting process is historically a long and tedious activity, physicians could acquire the attitude that it is not worthwhile and discover that they do not possess the ability to make time for error reporting.

Perceived Behavioural Control - Lack of Time

Lack of time is a heavily cited barrier to reporting error (Appelbaum et al., 2016; Brunsveld-Reinders et al., 2016; Gong et al., 2015; Hewitt et al., 2017; Holmström et al., 2015; Pfeiffer et al., 2013; Poorolajal et al. 2015; Soydemir et al., 2017). As previously

discussed, physicians feel as though they do not even have time to eat, let alone fill out an error reporting form (Haw et al., 2014; Puddester et al., 2009). An additional disincentive to reporting is the fact that reporting is too time-consuming (Denny, 2017; Folligah, 2018; Gong et al., 2015; Haw et al., 2014; Health Quality Ontario, 2017; Mahdaviazad et al., 2020; Rishoej et al., 2018; Rubin et al., 2019; Scott & Henneman, 2017). In a survey of 186 physicians, 50% of respondents (n=93) felt that the error reporting form was too time-consuming to complete (Polisena et al., 2015). For better time management, there should be a certain amount of time set aside for physicians to ensure they have the energy and time to report errors they have made or observed (Gong et al., 2015). Reporting not only takes extra time, but also extra work and effort in an already energy-demanding profession. Supplementary workload burden is another mentioned barrier to reporting (Crane et al., 2015; Haw et al., 2014). The practical aspect of reporting forms can be perceived as cumbersome and have unfavourable characteristics which make reporting more difficult (Hartnell et al., 2012). In a study by Hartnell et al. (2012) a physician said “one time after I got one done (a report), I thought this is it. I am not doing this again because it’s too much. It’s just a lot of work” (p.364). Another physician in the study by Haw et al. (2014) explained that if physicians did all of the paperwork they were expected to do, they would never be able to see patients. Some suggestions for facilitating error reporting included reducing reporter burden by making reporting quicker and easier (Hartnell et al., 2012).

Discussion

The true number of physician error consequences that occur is unknown, in part, due to underreporting. Physicians can make errors during the diagnostic process or treatment. Diagnostic errors are estimated to occur 10-15% of the time in medicine (Graber, 2013), but are very difficult to measure since it relies on the cognitive abilities of each physician (Singh, 2013). Treatment errors may occur with medication or during surgery, but it has been suggested that operating rooms are the most likely place for an error to occur (Arora et al., 2010; Shouhed et al., 2012). Checklists have been adapted from aviation to surgery to increase safety (Kapur et al., 2015). Preoperative planning with checklists could be used as a cognitive aid that creates open communication before surgery and ensures nothing is forgotten (Gaba, 2011; Schelkun, 2014). However, while aviation has better reporting practices to improve safety, the unpredictability and inability to standardize every aspect of healthcare should be considered when comparing the two industries.

It is vital that reporting systems not only collect data but also reduce error by analyzing the reports (Gong et al., 2015; Kohn et al., 1999) and subsequently implementing a corrective action plan (Baker et al., 2008). However, the physician must first report the error. The literature review revealed that electronic forms are more efficient and have better response and feedback time (Atherton, 2002; White, 2007). Expectations of reporting could be clarified by consistent laws, policies, and practices (McCartney, 2013). The legal requirement for reporting errors or near misses currently varies across Canadian jurisdictions, and only four provinces have passed legislation that requires PSI reporting: Saskatchewan, Manitoba, Ontario, and Quebec. Each province or territory provides its

definitions, what they expect to be reported, how the event is reported, and to whom. (Baker et al., 2008; McCartney, 2013). But regardless of which province they practice medicine, the physician has the responsibility to report errors as outlined in the Canadian Medical Association's Code of Ethics (CMA, 2018). Physicians have the ethical responsibility to report and disclose errors they have committed as well as to report errors or misconduct they have witnessed a colleague committing (CMA, 2018).

The objective of this major paper was to identify and describe the causes and types of physician error, the reporting mechanisms of error, as well as the predominant factors which can affect physician error reporting behaviour. The literature review provided the results to achieve the objective of this major paper. Based on the extensive review it can be concluded that reporting system and process, psychological safety, manager and supervisor support, feedback, teamwork and peer support, and lack of time, are the main factors that directly influence physician error reporting behaviour.

Interpretations

While poor communication/teamwork, lack of knowledge as well as heavy workload are known causes of physician error, it was revealed that they are also contributing factors to reporting an error. This is an important consideration since initiatives to increase reporting could also decrease errors by mitigating the causes of error. The time required to track errors and implement improvements for patient safety was reduced by 25-50% when moving from paper to electronic forms (Atherton, 2002; White, 2007), which is an important consideration since feedback was a very important factor for not reporting errors. In addition, lack of feedback can make physicians feel as though their managers do

not respect their already coveted time. Receiving feedback and seeing change is significant for physicians to find meaning in their errors and increase patient safety (Plews-Ogan et al., 2016). Another unexpected finding was revealed when researching Canadian policies and legislation. What was astounding was that only four provinces out of the ten provinces and three territories in Canada have error reporting language in their legislation. Aviation provided a great example of the federal role in passenger safety and adverse events; however, healthcare is a provincial responsibility. In my opinion, the federal government in Canada should have some sort of regulating role in ensuring that all provinces and territories have error reporting and patient safety in their legislation. Ensuring the policies not only exist but also contain the same definition and language could facilitate pan-Canadian reporting and sharing information.

Workload proved to be a very important factor that can influence error reporting. It not only affects physicians' time management but is also a cause of error and a contributing factor for underreporting. In aviation practices, work-hour limitations ensure pilots are fit for duty and can keep all passengers safe (Kapur et al., 2015). However, in healthcare, these limitations only exist for physicians in training, not for experienced personnel (Singer et al., 2010). As previously revealed, physicians work an average of 49.54 hours per week (CMA, 2019c) and 107.7 on-call hours per month (CMA 2019b). Therefore, physicians who provide additional on-call hours work 76.47 hours per week. So, while lack of time was a heavily cited barrier to reporting, the studies found in this literature review merely named lack of time as a factor, but physician perception of their time to report was not explored. Another revelation is that physician gender, race, department, or years of experience do not influence physician error reporting behaviour (Appelbaum et al., 2018; Castel et al.,

2015; Rishoej et al., 2018). I assumed that that age may affect the perceived ease of use of the reporting system. Indirectly, the fact that years of experience is not an influence on reporting did demonstrate that age is not a factor that influences reporting. However, I presumed that older physicians would perceive more barriers since the technological aspect of reporting errors using electronic systems could pose an issue. Overall, the results of this literature review met my expectations. The key factors that influence error reporting are predominant in the literature and are indicative of reporting barriers and enablers.

Effectiveness of the TPB

The Theory of Planned Behaviour (TPB) emphasizes that behavioural intention is the direct antecedent of the behaviour itself (Ajzen, 1991). As previously stated, intentions are determined individually by three constructs: attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). Upon evaluation of each construct and its considerations, I believe that the TPB meets the purpose of this major research paper; this theory can be used to identify barriers that influence error-reporting behaviour. Each construct is well-founded and there is ample literature to support the use of the TPB to evaluate error reporting (Denny, 2017; Lee et al., 2015; Thompson-Leduc et al., 2015). To add, the model is focused on intra-individual and interpersonal factors that may influence reporting; it includes attitude, subjective norms, and behavioural control, which literature has shown to have a large influence on people's intentions to engage in behaviour (Lee et al., 2015).

For this paper, the TPB worked well with grouping the factors by attitude, subjective norm, and perceived behavioural control. This lens was helpful during the literature search period due to the fact that it ensured that each construct was considered for every factor associated with error reporting. As can be seen in *Table 4*, some of the factors which can influence physician error reporting did not fit into each construct. Behavioural control appeared to be the least influential overall for error reporting and attitude towards reporting is the most predominant.

Table 4: Factors Associated to Error Reporting and the TPB

	Attitude	Subjective Norm	Perceived Behavioural Control
Reporting System & Process	X	X	X
Psychological Safety	X	X	
Manager & Supervisor Support	X	X	
Feedback for Patient Safety Improvement	X		
Teamwork & Peer Support	X	X	
Lack of Time	X		X

It should be noted that age, sex, or culture, are not accounted for in the literature on physician error reporting and do not indicate whether these are factors to consider. However, this was not a limitation since it was revealed that they are not barriers or enablers to reporting. Another factor missing in the TPB's constructs is past behaviour. This factor failed to meet the inclusion criteria of Ajzen's 1985 Theory of Planned

Behaviour. Ajzen (2011) agreed that this was a limitation since “the more frequently a behaviour has been performed in a stable context, the more it is said to habituate and come under the direct control of external stimulus cues at the expense of intentions” (p.1120). Moreover, if the physician has engaged in reporting behaviour in the past, habitual reporting is more likely to occur. Contrarily, if they have had a past negative experience with reporting it could pose a threat to their future reporting behaviour. This is rooted in all of the factors which can influence reporting. A physician who has reported an error in the past and has experienced all of the negative responses will be less likely to report in the future. Lack of implementation of change, punitive action, lack of support from management, lack of feedback, lack of peer support, as well as lack of time to report can all contribute to underreporting again in the future. On the other hand, a physicians who has had a supportive experience is more likely to report in the future

The categorization of each factor into the three constructs are my interpretations and are subjective. However, this is not a critical limitation as it is still clear that each factor can lead to intention and willingness to report physician error.

Limitations

Due to the nature of this research paper, there are various limitations to consider. As each paper reviewed itself had limitations, they are compounded by this research. For instance, most of the articles did not take into account that the willingness to report may vary according to different kinds of PSI's, many studies could have been influenced by recall bias when thinking of their past errors, and most findings focused on the intention to report as the primary outcome so actual event reporting can only be inferred. To add, since

this was not a thesis-based paper, it did not present new findings, it was beyond the scope of this study to find new factors that influence error reporting. Although a strenuous effort was made to use Canadian data, a significant amount of the references was found outside of this region. Therefore, the results aren't necessarily indicative of Canadian physicians' intentions to report. Studies were therefore selected from regions that have similar health care systems. Further, access to appropriate literature and journals is an additional limitation to consider. Some pertinent studies could have been excluded from this paper due to the lack of journals to which my institution was not subscribed. Finally, this study has only considered physicians in a health care system that is comprised of multiple professions. Thus, the factors are not generalizable for the entire industry.

Recommendations for Future Research

In this paper, I sought to determine the factors that influence physician error reporting behaviours. The existing literature adequately outlines the barriers and enablers to physician error reporting. Based on the findings of this review, research is needed on effectively addressing the barriers to reporting. Qualitative research is needed to understand how physicians feel about each of the barriers and the degree to which each barrier affects reporting. This could provide insight into which barriers need to be addressed more urgently than the others. Researchers should also conduct studies that examine actual reporting behaviour instead of intention to report. This could be done by adding a questionnaire at the end of the reporting systems form for physicians to fill out directly following the submission of their report. This could provide a better understanding of the enablers and potential barriers that the physician overcame when they decided to

report their error. To add, this could eliminate hindsight bias as well as recall bias if the questionnaire is completed directly after the report. Further, if researchers can continue to track the changes in factors that influence reporting over time, they can continue to define ways to increase patient safety after the implementation of patient safety practices and reporting initiatives that have addressed existing barriers. This could be done by conducting longitudinal studies to see how the factors change over time and how the implementation of new practices can change the number of perceived barriers.

Further research is needed to address the factors that influence Canadian physician's willingness to report errors. There is ample research done on American physicians but very few have researched the factors that influence Canadian physician error reporting. Given that Canada has a universal healthcare system, it would be interesting to see why physicians still fear litigation and how the safety culture compares to the culture in the United States of America. A mixed methods approach of interviews and questionnaires of physicians perception of their culture could provide insight into why physicians have similar cultures in completely different healthcare systems.

Recommendations for Future Practice

Surgical errors are important as studies have suggested that operating rooms (ORs) are the most likely place for an error to occur (Arora et al., 2010; Shouhed et al., 2012). They discovered that surgeon-caused errors were found in surgical technique and performance, as well as in the formulation of the pre-or post-operative treatment plan (including choice of the procedure) (Bosma, Veen, & Roukema, 2011). Aviation safety practices could be adapted to healthcare, not only by imposing non-punitive reporting

standards but also by implementing surgical checklists to reduce errors in surgical procedures. It has been suggested by Kapur et al., 2015, that healthcare could begin to publish the lessons learned from PSI investigation and implement them into training, like aviation. Since healthcare is regulated at the provincial level in Canada, creating a national information-sharing platform in regards to adverse events and lessons learned could benefit Canadian patient safety. To add, reporting systems and policies should be consistent across Canada as it is in Aviation. While healthcare is provincial, it would be beneficial for patient safety learning if all provinces and territories have similar definitions, and policies. This would ensure that shared information is more universally understood as well as guarantee that physicians across Canada are following the same reporting standards. In Canadian aviation, there are reporting systems, practices, and laws in place at the federal level. While this isn't necessarily attainable in healthcare, the federal government of Canada could regulate what was expected of each province and territory where policies are concerned. If Canada enacted legislation which states that all provinces must have reporting policies and practices in place, more than four provinces would have reporting in their legislature and policies. Also needed is a pan-Canadian way of reporting. When institutions create their reviewing committees and reporting measures, this can create a barrier in sharing data provincially and nationally. The Saskatchewan Critical Incident Guideline (2004) in *Appendix A* is a worthy example of what the federal government could provide to ensure that all errors are being reported in the same manner. This would create a more consistent data collection for reporting errors as all Canadian physicians would be held to the same standard of reporting. Intuitive guidelines could

facilitate physician error reporting. Uncertainty about how to report errors can impede transparency and reporting among physicians.

Further, the current error reporting culture must be changed to encourage reporting. Including proper reporting etiquette and practices in the medical school curriculum could address this issue. It could destigmatize error reporting and change the culture over time and could increase physician competencies around understanding error. Learning from error is important not only for the physician to attribute meaning to their error, but also to ensure that the error is not committed again. Teaching our future physicians about this topic could minimize the effects of error on physicians and increase patient safety.

To better address the barriers to reporting error, managers should promote the use of the reporting system while emphasizing that there will be no punitive action or blame; if managers show that they are pleased to see the use of the reporting system, physicians are more likely to use it. To add, it is important for self-efficacy, that all staff be extensively trained on how to use the system and about the types and definitions of error. Leadership should ensure that all staff, not just physicians, are proficient in recognition of error as well as reporting. Ideally, the medical school curriculum should include a more extensive course about medical errors, error reporting, and coping with errors.

Well-designed peer support programs should be offered at every institution since they provide physicians with the chance to share their stories with understanding colleagues, who offer unique insight and empathetic ear (Pratt & Jachna, 2015). These programs can be beneficial to error reporting because colleagues who are trained to make space for feelings are more likely to be more helpful. Finally, for better time management

and to relieve workload, physicians should be able to set aside a certain amount of time to ensure they have energy and time to report errors (Gong et al., 2015). This can be done by making reporting easier and quicker.

Conclusion

Patients should not have to withstand harm or die for policies and practices to change. By allowing the continuance of underreporting, people continue to be harmed by preventable physician errors. In Canada, patients suffered preventable harm in more than 138,000 different hospitalizations (CIHI, 2016). Physicians can commit two types of errors: diagnostic or errors in treatment. Further, there are many physician-related causes of error which include: fatigue, inaccurate examination, negligence, wrong diagnosis, poor communication, lack of knowledge, etc. (Bari et al., 2016; Hall et al., 2016; Sheikhtaheri et al., 2018). No matter what the cause, errors must be reported to ensure continuous learning and improvement. Whether mandatory, voluntary, paper or electronic reporting systems are used, the ultimate goal is to analyze the error report information and identify ways to prevent errors from occurring. By reducing barriers and increasing the enablers of physician error reporting, patient safety would undoubtedly increase. We can ensure the same errors do not occur again by addressing the predominant factors within the reporting system and process, physician psychological safety, manager support, feedback for patient safety improvement, teamwork and peer support, as well as lack of time. We must share and learn from our errors as “we cannot fix what we do not measure” (Graber, 2013, p. 25). Despite efforts to increase reporting, further research and implementation of practices are needed to reduce the barriers that influence physician error reporting and increase the enablers.

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Appendices

Appendix A: Aviation occurrent reporting form (TSB, 2019)

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

Aviation occurrent reporting form

From	Name	<input type="text"/>	Mailing address	<input style="height: 40px;" type="text"/>		
	Organization	<input type="text"/>				
	Email address	<input type="text"/>				
	Telephone	<input type="text"/>	Fax	<input type="text"/>		
Aircraft	Registration	<input type="text"/>	Manufacturer	<input type="text"/>		
	Nationality	<input type="text"/>	Model	<input type="text"/>		
Owner	Name or organization	<input type="text"/>	E-mail address	<input type="text"/>		
		<input type="text"/>	Phone number	<input type="text"/>		
Operator	Name or organization	<input type="text"/>	E-mail address	<input type="text"/>		
		<input type="text"/>	Phone number	<input type="text"/>		
Pilot-in-command	Name	<input type="text"/>	E-Mail address	<input type="text"/>		
	Licence number	<input type="text"/>	Phone number	<input type="text"/>		
Flight details	Flight number	<input type="text"/>	Departure	<input type="text"/>		
	Departure date	<input type="text"/>	Intended destination	<input type="text"/>		
	Departure time	<input type="text"/>	Actual destination	<input type="text"/>		
Occurrence details	Occurrence date	<input type="text"/>	Occurrence location	<input style="height: 40px;" type="text"/>		
	Occurrence time	<input type="text"/>				
Persons on board	Total #	<input type="text"/>				
	Flight crew #	<input type="text"/>				
	Cabin crew #	<input type="text"/>				
	Passengers #	<input type="text"/>				
Injuries		<input type="text"/>	Fatal	Serious	Minor	None
	Flight crew	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Cabin crew	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Passengers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Dangerous goods on board or released from aircraft?	<input type="checkbox"/> Yes	Description	
	<input type="checkbox"/> No		

Damage to aircraft, environment or property?	<input type="checkbox"/> Yes	Description	
	<input type="checkbox"/> No		

Occurrence summary / Description of events

Post occurrence actions / Maintenance



Email to the appropriate TSB regional office:

Pacific - airnotifications.vancouver@tsb-bst.gc.ca
 Western - airnotifications.edmonton@tsb-bst.gc.ca
 Central - airnotifications.winnipeg@tsb-bst.gc.ca
 Ontario - airnotifications.toronto@tsb-bst.gc.ca
 Quebec - airnotifications.montreal@tsb-bst.gc.ca
 Atlantic - airnotifications.dartmouth@tsb-bst.gc.ca
 International or Uncertain - airops@tsb-bst.gc.ca

Do you believe this report requires immediate attention by a TSB Investigator? Yes No

Appendix B: Saskatchewan Critical Incident Reporting Guideline (2004)

Saskatchewan Critical Incident Reporting Guideline, 2004

By “critical incident” we mean a serious adverse health event including, but not limited to, the actual or potential loss of life, limb or function related to a health service provided by, or a program operated by, a regional health authority (RHA) or health care organization (HCO).
(Additional definitions of terms can be found in Section VII of the Guideline.)

The following is a list of events that must be reported to Saskatchewan Health. The final item in each category allows for the possibility of adverse health events that fit the description given above, but were not anticipated when the list was created. Such events are also reportable.

I SURGICAL EVENTS (Surgery includes endoscopies and other invasive procedures)

- a) Surgery performed on a wrong body part
(Defined as any surgery performed on a body part that is not consistent with the documented informed consent for that patient. Excludes emergent situations that occur in the course of surgery and/or whose exigency precludes obtaining informed consent.)
- b) Surgery performed on the wrong patient
(Defined as any surgery on a patient that is not consistent with the documented informed consent for that patient.)
- c) The wrong surgical procedure performed on a patient
(Defined as any procedure performed on a patient that is not consistent with the documented informed consent for that patient. Excludes emergent situations that occur in the course of surgery and/or whose exigency precludes obtaining informed consent.)
- d) Retention of a foreign object in a patient after surgery or other procedure
(Excludes objects intentionally implanted as part of a planned intervention and objects present prior to surgery that were intentionally retained.)
- e) Death during or immediately after surgery of an ASA classification I-II¹ patient
(Includes procedures where anesthesia was administered; the planned surgical procedure may or may not have been carried out. Immediately after surgery means within 24 hours of surgery or other invasive procedure, or, if surgery was not completed, within 24 hours of induction of anesthesia.)
- f) Unintentional awareness during surgery with recall by the patient
- g) An adverse health event leading to death or serious disability associated with any other surgical event while a patient is receiving a health care service provided by an RHA or HCO

II PRODUCT OR DEVICE EVENTS

- a) Patient death or serious disability associated with the use of contaminated drugs, devices, or biologics provided by an RHA or HCO
(Includes generally detectable contaminants such as infectious matter or foreign substances in drugs, devices, or biologics regardless of the source of contamination and/or product.)
- b) Patient death or serious disability associated with the use or function of a device in patient care in which the device is used or functions other than as intended
(Includes, but is not limited to, catheters, drains, and other specialized tubes, infusion pumps, ventilators, and mechanical devices used to lift, bathe, or shower patients.)

¹ ASA Classification I - Normal healthy patient, II - A patient with mild systemic disease. Canadian Anesthesiologists' Society. *Appendix II: American Society of Anesthesiologists' Classification of Physical Status*. Retrieved May 2004 from website www.cas.ca.

- c) Patient death or serious disability associated with intravascular air embolism that occurs while being cared for by an RHA or HCO
(Excludes deaths associated with neurosurgical procedures known to present a high risk of intravascular air embolism.)
- d) An adverse health event leading to death or serious disability associated with any other product or device while a patient is receiving a health care service provided by an RHA or HCO

III PATIENT PROTECTION EVENTS

- a) An infant discharged to the wrong person
- b) Patient death or serious disability associated with patient disappearance
(Excludes events involving competent adults.)
- c) Patient suicide or attempted suicide resulting in serious disability while being cared for by an RHA or HCO
(Defined as events that result from patient actions after admission to a facility or program of the RHA or HCO. Excludes deaths resulting from self-inflicted injuries that were the reason for admission to a hospital.)
- d) An adverse health event leading to death or serious disability associated with any other patient protection event while a patient is receiving a health care service provided by an RHA or HCO

IV CARE MANAGEMENT EVENTS

- a) Patient death or serious disability associated with a medication or fluid error including, but not limited to, errors involving the wrong drug, the wrong dose, the wrong patient, the wrong time, the wrong rate, the wrong preparation, or the wrong route of administration
(Excludes reasonable differences in clinical judgment on drug selection and dose.)
- b) Patient death or serious disability associated with a hemolytic reaction due to the administration of ABO-incompatible blood or blood products
- c) Maternal death or serious disability while being cared for by an RHA
(Includes events that occur within 42 days post-delivery.)
- d) Full-term fetal or neo-natal death or serious disability associated with labour or delivery while being cared for by an RHA
(Full-term fetus is >37 completed weeks gestation. Neonate refers to the first 28 days of life. Includes failure to screen for and prevent neonatal post-discharge dehydration or illness related to phenylketonuria.)
- e) Patient death or serious disability associated with hypoglycemia, the onset of which occurs while the patient is being cared for by an RHA or HCO
- f) Neonatal death or serious disability, including kernicterus, associated with failure to identify and treat hyperbilirubinemia
(Hyperbilirubinemia is defined as bilirubin levels >500 µmol/L. Neonate refers to the first 28 days of life.)
- g) Stage 3 or 4 pressure ulcers acquired after admission to a facility of an RHA or HCO
(Excludes progression from Stage 2 to Stage 3 if Stage 2 was recognized upon admission.)
- h) Patient death or serious disability associated with a delay or failure to transfer a patient in keeping with the Saskatchewan Health Critical Care Patient Management and Transfer Process Policy
- i) Error in diagnosis, where the treatment provided or not provided leads to patient death or serious disability

- j) An adverse health event leading to death or serious disability associated with any other care management event while a patient is receiving a health care service provided by an RHA or HCO

V ENVIRONMENTAL EVENTS

- a) Patient death or serious disability associated with electric shock while being cared for by an RHA or HCO
(Excludes events involving planned treatments such as electric countershock.)
- b) Any incident in which a line designated for oxygen or other gas to be delivered to a patient contains the wrong gas or is contaminated by toxic substances
- c) Patient death or serious disability associated with a burn incurred from any source while being cared for by an RHA or HCO
- d) Patient death associated with a fall while being cared for by an RHA or HCO
- e) Patient death or serious disability associated with the use or lack of restraints or bedrails while being cared for in a facility
- f) Patient death or serious disability associated with the failure or de-activation of exit alarms or environmental monitoring devices
- g) Patient death or serious disability incurred as a result of transport arranged or provided by an RHA or HCO
(Includes loss of control of a vehicle or aircraft, as well as actual or potential single vehicle accidents or multi-vehicle collisions, for example, transportation in a ground ambulance, air ambulance, medical taxi or chartered aircraft.)
- h) Patient death or serious disability associated with a delay or failure to reach a patient for emergent or scheduled services provided by an RHA or HCO
(Includes delay due to extreme weather conditions, poor roads, communication breakdown. Includes, but is not limited to, EMS and homecare services.)
- i) An adverse health event leading to death or serious disability associated with any other environmental event while a patient is receiving a health care service provided by an RHA or HCO

VI CRIMINAL EVENTS

- a) Any instance of care ordered by or provided by someone impersonating a physician, nurse, pharmacist, or other licensed health care provider
- b) Abduction of a patient of any age
- c) Sexual assault of a patient that occurs on grounds owned or controlled by an RHA or HCO
- d) Patient death or serious disability from a physical assault that occurs on grounds owned or controlled by an RHA or HCO
- e) Any sexual or physical assault of a patient perpetrated by an employee, member of the medical staff, or an individual under contract with an RHA or HCO
(Includes, but is not limited to, assaults perpetrated at a patient's home while receiving home care or mental health services.)
- f) An adverse health event leading to death or serious disability associated with any other criminal event while a patient is receiving a health care service provided by an RHA or HCO

VII DEFINITIONS

“Adverse health event”

means an unintended injury or complication that is caused by health care management rather than by the patient’s underlying disease process. Health care management includes the actions of individual staff members as well as broader systems and care processes. Health care management includes acts of omission (e.g. failure to diagnose, failure to treat) as well as acts of commission (e.g. incorrect diagnosis, incorrect treatment, poor performance).²

“Associated with”

means that it is reasonable to initially assume that the critical incident was due to the referenced course of care; further investigation and/or root cause analysis of the unplanned event may be needed to confirm or refute the presumed relationship, but should not delay notification to Saskatchewan Health.

“Biologics”

means a drug that is prepared using a biological source material (derived from a microorganism, virus, animal, human, or plant) and using, for example, either conventional manufacturing methods, recombinant DNA technology, and/or other novel approaches. Some examples of biologics include vaccines, blood and its derivatives, certain hormones and enzymes, recombinant DNA products, gene therapies, and transgenics.³

“Disability”

means a physical or mental impairment that substantially limits one or more of the major life activities of an individual.

“Patient”

means a client, resident, or patient.

“Regional Health Authority” or “Health Care Organization”

includes any services or programs offered by the entities as defined in *The Regional Health Services Act*.

VIII REFERENCES

The *Saskatchewan Health Critical Incident Reporting Guideline, 2004* is adapted from:
The National Quality Forum. *Serious Reportable Events in Healthcare: A Consensus Report*. National Forum for Health Care Quality Measurement and Reporting, 2002.⁴

² Definition adapted from Baker, G.R., Norton, P.G., et al. *The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada*. CMAJ 2004; 170:1678-1686.

³ Definition adapted from Health Canada, Health Products and Food Branch, Therapeutic Products Directorate (www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt/index_e.html).

⁴ The National Quality Forum is a private, nonprofit, open membership organization created to develop and implement a U.S. strategy for healthcare quality measurement, and reporting.

Appendix C: References Citing Types of Fears

Types of fears	Cited by	Number of articles
Fear of litigation	(Appelbaum et al., 2016) (Butt, 2010) (Denny, 2017) (Dossett et al., 2018) (Folligah, 2018) (Ha & Longnecker, 2010) (Hartnell et al., 2012) (Health Quality Ontario, 2017) (Howie, 2009) (Kaldjian et al., 2008) (Machen et al., 2019) (Mahdaviazad et al., 2020) (Naveh & Katz-Navon, 2014) (Pfeiffer et al., 2013) (Poorolajal et al., 2015) (Wolf & Hughes, 2008) (Wu et al., 2008) (Zabari & Southern, 2018)	18
Fear of retribution	(Abstoss et al., 2011) (Appelbaum et al., 2016) (Crane et al., 2015) (Denny, 2017) (Hartnell et al., 2012) (Health Quality Ontario, 2017) (Hewitt et al., 2017) (Kaldjian et al., 2008) (Machen et al., 2019) (Naveh & Katz-Navon, 2014) (Pfeiffer et al., 2013) (Perez et al., 2014) (Poorolajal et al., 2015) (Rishoej et al., 2018) (Rubin et al., 2019) (Wolf & Hughes, 2008) (Zabari & Southern, 2018)	14
Fear of blame	(Appelbaum et al., 2016) (Health Quality Ontario, 2017) (Hewitt et al., 2017) (Mahdaviazad et al., 2020) (Naveh & Katz-Navon, 2014) (; (Rishoej et al., 2018) (Scott & Henneman, 2017) (Soydemir et al., 2017) (Wolf & Huges, 2008) (Zabari & Southern, 2018)	10
Fear of appearing incompetent	(Appelbaum et al., 2016) (Folligah, 2018) (Hartnell et al., 2012) (Hewitt et al., 2017) (Lee et al., 2015)(Pfeiffer et al., 2013) (Soydemir et al., 2017)(Wolf & Hughes, 2008)	8
Fear for reputation/job	(Hewitt et al., 2017) (Jahromi, Parandavar, & Rahmanian, 2014)(Machen et al., 2019) (Poorolajal et al., 2015)(Soydemir, Intepeler, & Mert, 2017) (Wolf & Hughes, 2008) (Wu et al., 2013)(Zabari & Southern, 2018)	8