Interventions to Change Clinician Behaviour in Relation to Suicide Prevention Care in the Emergency Department: A Scoping Review

by

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Submitted in partial fulfilment of the requirements
for the degree of Masters of Science

at

Dalhousie University
Halifax, Nova Scotia
April 2021

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ABSTRACT

Introduction: An emergency department (ED) is a critical place for suicide prevention, yet patients are often discharged without proper suicide risk assessments and/or referrals. In response, we must support ED clinicians' behaviour change following evidence-based suicide prevention. This scoping review aimed to explore, characterize, and map the literature on interventions implemented to change ED clinicians' behaviour related to suicide prevention using the Behaviour Change Wheel as a guiding framework.

Methods: This scoping review followed the Joanna Briggs Institute methodology. The search included PubMed, PsycInfo, CINAHL, Embase, and grey literature.

Results: This review included 70 citations for extraction, and there were 66 interventions that targeted ED clinicians' behaviour change related to suicide prevention. The frequency of intervention functions was identified across the 66 interventions: *Education* (n=48), *Training* (n=40), *Enablement* (n=36), *Persuasion* (n=21), *Environmental restructuring* (n=18), *Modelling* (n=7), and *Incentivization* (n=2). Studies reported outcome measures of effectiveness at clinician (n=38), patient (n=4) and/or organization levels (n=6). Few studies reported implementation outcomes, such as measures of reach (n=5), adoption (n=5), fidelity (n=1) or feasibility (n=1).

Conclusion: This scoping review generated a profile of existing interventions that target ED clinicians' behaviour change. This review serves as a foundation for future research as it provides theory-based suggestions and identifies specific areas of improvement for behaviour change interventions for ED-based suicide prevention care.

LIST OF ABBREVIATIONS USED

COM-B	Capability, Opportunity, Motivation – Behavioural Model
BCW	Behaviour Change Wheel
ED	Emergency Department
ED-SAFE	Emergency Department Safety Assessment and Follow-up Evaluation
IOF	Implementation Outcomes Framework
JBI	Joanna Briggs Institute
SAMHSA	Substance Abuse and Mental Health Services Administration
SAFE-T	Suicide Assessment Five-Step Evaluation and Triage
SRB	Suicide-Related Behaviours
SRT	Suicide-Related Thoughts
SRTB	Suicide-Related Thoughts and Behaviours
SPRC	Suicide Prevention Resource Centre
PHAC	Public Health Agency of Canada
PSS	Patient Safety Screener
RE-AIM	Reach, Effectiveness, Adoption, Implementation, Maintenance
TDF	Theoretical Domains Framework
WHO	World Health Organization

ACKNOWLEDGEMENTS

This thesis would not have been possible without the incredible support and inspiration from my family, friends, supervisors and committee members.

I would like to thank my supervisors, Dr. Janet Curran and Dr. Christine Cassidy, for their tremendous support throughout this thesis project. You have given me numerous valuable learning opportunities that have strengthened my research abilities and prepared me to start another chapter in my academic journey. Your mentorship and encouragements have also helped me become a more confident academic researcher and writer.

My appreciation also extends to my committee members, Dr. Lori Weeks and Dr. Leslie Anne Campbell, for giving me constructive feedback in completing this thesis. Your teaching has helped me advance further as an academic researcher.

I would also like to thank my friends and colleagues for their support and meaningful feedback that contributed to my critical thinking. Your intelligence and talents are true inspirations to me.

Lastly, a huge thank you to my Mom and Dad, Yongjae Kim and Dongkil Shin, simply for being my parents. No words can describe how thankful I am to be your daughter. My work ethic comes from what you have shown me as incredible parents and immigrants, and your love, sacrifice, support, and wisdom are what helped me grow to be who I am today. I love you both so much. And of course, I would like to thank my sister, Seung Yeon Shin, for being my cheerleader and celebrating every big and small milestone with me along the way. You always inspire me with your creativity, and I am blessed to call you my best friend.

CHAPTER ONE: INTRODUCTION

1.1 Incident of Suicide

Suicide is a serious public health concern internationally, with approximately 800,000 people worldwide dying due to suicide every year (World Health Organization [WHO], 2016). This trend is mirrored in Canada, where there are approximately 4,000 deaths to suicide every year, approximately 11 deaths daily (Public Health Agency of Canada [PHAC], 2019). Suicide is currently the ninth leading cause of death in Canada across all ages (PHAC, 2019), and it is the second leading cause of death among those who are 15-34 years of age (PHAC, 2019). The number of reported cases of suicidal ideation (e.g., having thoughts of suicide) is much greater; in 2015, 3,396,700 Canadians over 15 years of age reported that they have seriously thought about ending their own lives in their lifetime (Statistics Canada, 2015). Suicide can happen at any time in the lifespan and efforts are needed to mitigate the extent of the problem.

1.2 Defining Suicide Related Thoughts and Behaviours

In the suicide literature, the use of standard definitions is necessary to aid clear communication and understanding of the research findings (Linehan et al., 2006). However, international consensus on exact terminology is yet to be achieved. To aid consistent communication throughout this paper, I will use definitions proposed by Crosby et al. (2011), which adapt part of Silverman et al.'s nomenclatures (2007a, 2007b) and are consistent with the terminologies used in the Government of Canada's framework for suicide prevention (2016).

'Suicide' is defined as "death caused by self-directed injurious behaviour with any intent to die as a result of the behaviour" (Crosby et al., 2011, p. 23). 'Suicidal

ideation' or having thoughts of suicide is defined as "thinking about, considering, or planning for suicide" (Crosby et al., 2011, p. 11). 'Self-harm' and 'self-inflicted' injuries indicate behaviours that are self-directed and self-deliberate which result in injury or potential injury (Crosby et al., 2011). Importantly, these behaviours may occur in the absence of suicidal ideation (O'Connor et al., 2007). 'Suicide attempt' refers to a non-fatal outcome due to a self-inflicted and potentially injurious behaviour with any intent to die, and 'suicide attempt' does not necessarily have to result in injury (Crosby et al., 2011, p.21). 'Intent' is defined as the aim or goal—not the 'motive'—which refers to reasons for suicide (Silverman et al., 2007a). Intent of suicide is difficult to assess, and in the suicide literature, individual's suicide intent has been assessed using a scale such as the Suicide Intent Scale (Beck et al., 1974). 'Suicide-related behaviours' refer to a spectrum of behaviours including intending suicide, attempting suicide and suicide itself (Silverman et al., 2007b). The inclusion of 'suicide ideation' in 'suicide-related behaviour' is a complex issue. Suicide ideation is "purely cognitive" and describing suicide ideation and suicide-related behaviour in totality as "suicidality" constitutes academic debate (Silverman et al., 2007b, p. 257). Furthermore, this totalization is not helpful since there are specific constructs to describe and distinguish ideation, behaviour, attempts and suicide (Meyer et al., 2010). Consistent with Crosby et al., (2011) and Silverman et al., (2007b), I will use the term 'suicide-related thoughts and behaviours' (SRTB) and make a distinction between 'suicide-related thoughts' (SRT) (i.e., suicidal ideation) and 'suicide-related behaviours' (SRB) where necessary.

1.3 Response to the Serious Public Health Concern of Suicide

WHO's Mental Health Gap Action Programme proposed in 2008 identifies suicide as one of the main health priorities and provides evidence-based guidance to expand service provisions around the world (WHO, 2008). Further, WHO (2014) proposed the need for effective national strategies for suicide prevention. A national strategy needs to be multisectoral including, but not limited to, health system, education, politics and the media (WHO, 2018). Several countries around the world have a national suicide prevention strategy in response to the significance of suicide and its burden on society. For example, "Connecting for Life: Ireland's National Strategy to Reduce Suicide 2015–2020" in Ireland, "Life Love Plan: Third Basic Plan for Suicide Prevention" in the Republic of Korea, "2012 National Strategy for Suicide Prevention: Goals and Objectives for Action" in the United States of America, and "National Strategic Plan on the Prevention of Suicide in Namibia 2012–2016" in Namibia (WHO, 2018). Although not a national strategy, the Government of Canada (2016) has also proposed a framework for suicide prevention, and the province of Nova Scotia (2020) newly released the Suicide Prevention and Risk Reduction Framework. Common components found in a national strategy—aligned with WHO's proposed strategic approach for suicide prevention (2014)—include, but not limited to, means restriction, responsible media reporting and training, stigma reduction and surveillance. Further, evidence exists to support the effectiveness of means restrictions (Zalsman et al., 2016), responsible media reporting (Niederkrotenthaler et al., 2020) and the training of primary care providers (Bennett et al., 2015).

1.4 Suicide is Complex

Despite the increased evidence and national efforts across the world, suicide remains a significant problem as demonstrated by an increasing trend in suicide rates in the United States from 2015 to 2017 among those who are15-24 years old (Miron et al., 2019). In addition, the number of ED visits related to SRTB has doubled among youth from 2007 to 2015 in the United States (Burstein et al., 2019). Similarly, the rates of SRTB presentations among people of all ages have tripled from 2009 to 2018 in two Australian EDs (Stapelberg et al., 2020). The challenge with suicide prevention can be attributed to its complexity. Suicide and SRTB are multifaced phenomenon which involve genetic (van Heeringen & Mann, 2014), psychological (i.e., personality and individual differences) (O'Connor & Nock, 2014), and social and cultural factors combined with past traumatic experiences (Bombay et al., 2019; Hawton & van Heeringen, 2009). There are also associations between having physical health problems, including heart disease and diabetes, and suicide and suicide attempt (Bin Wang et al., 2017; Webb et al., 2012). Above all, having a mental health diagnosis (e.g., mood disorder, substance use disorder) is one of the significant predictors of suicide (Chesney et al., 2014; Too et al., 2019), and a systematic review by Cavanagh et al. (2003) reported that mental illness has been contributing to 47-74% of suicide. Fortunately, there are protective factors (e.g., optimism, resilience) although evidence is scarce (Chang et al., 2013; Hirsch & Conner, 2006). Protective factors can positively modify individuals' response to external and environmental stressors that result in maladaptive outcomes (Rutter, 1985). In other words, protective factors can minimize the likelihood of manifestations that lead to suicide and SRTB in the presence of risks. Thus, not everyone

with a mental health diagnosis exhibit SRTB (Arsenault-Lapierre et al., 2004), nor all who die by suicide have a mental health diagnosis (Burgess & Hawton, 1998). As seen, suicide and SRTB are complex, and therefore, suicide prevention should be multifaced and multi-leveled.

1.5 Emergency Department as a Critical Place for Suicide Prevention

The Emergency Department (ED) is one of a number of settings where suicide interventions are indicated (WHO, 2014). Under the Government of Canada's (2016) framework for suicide prevention, emergency medical services fall under the suicide prevention continuum, reinforcing the ED as a significant place for interventions and the need to readily respond when someone presents with SRTB or is at risk of suicide.

ED is an ideal place for suicide risk identification and suicide prevention for many reasons. Firstly, EDs are frequently accessed by the people who require mental health services. Individuals with mental health diagnoses are four times more likely to use ED for all reasons including physical and mental health problems (Soril et al., 2016), and having a family physician has not prevented frequent ED utilization (Kaltsidis et al., 2020). Family physicians may have limited mental health expertise, making the ED a logical choice for those seeking mental health care (Schraeder et al., 2018). Secondly, EDs are frequently accessed by the individuals who are at high risk of suicide, and acute suicidal ideation is an appropriate reason for seeking care at an ED. Substance abuse, depression, conduct disorder, and impulsivity are readily identifiable and significant risk factors for SRTB and death (Ceniti et al., 2020; Crandall et al., 2006; Gairin et al., 2003; Kaltsidis et al., 2020). In addition, individuals who present to EDs for self-harm are often chronic users of EDs and have a high rate of repeat self-harm and suicide (Ceniti et al.,

2020). Lastly, the demand for ED-based suicide prevention is increasing. The United States nationwide survey showed ED visits have doubled for suicide attempt and suicidal ideation among youth from 2007 to 2015 (Burstein et al., 2019). In summary, ED is frequently accessed for mental health care, and chronic users are often at high risk of suicide. All these reasons make the ED a critical place for timely identification and treatment of patients who are at risk of suicide.

1.5.1 Evidence-Based Suicide Prevention Care in the Emergency Department

ED clinicians (e.g., physicians, nurses, nurse practitioners, social workers) play an important role in all steps of suicide prevention. There is an extensive literature on ED-based suicide prevention care, and it can be broadly categorized as suicide risk screening and assessment, treatment (e.g., pharmacotherapy, patient education, joint safety planning, community mental health consultation), disposition decision (e.g., admission to hospital) and discharge (e.g., post-ED follow-up calls or visits) (Betz & Boudreaux, 2016; Wilson et al., 2019). Moreover, empathic care is recommended and required for all patients regardless of the types of suicide prevention intervention delivered (Betz & Boudreaux, 2016; Wilson et al., 2019). Experts encourage clinicians to actively engage in communication with patients who may feel vulnerable and stigmatized, especially when specialized mental health evaluation is not readily available (Betz & Boudreaux, 2016; Wilson et al., 2019). These ED-based suicide prevention interventions are described in greater detail in Chapter 2.

1.6 Current State of Emergency Department Suicide Prevention

Clinicians have a critical responsibility and opportunity in suicide prevention, and EDs are often seen as the only source of help for some people living with SRTB (Wise-

Harris et al., 2017). However, ED continues to face challenges with suicide prevention as evidenced by the reported number of suicide post ED visits despite frequent ED utilization. Most individuals who die by suicide had visited an ED within one year before their death (Cruz et al., 2011; O'Neill et al., 2019), and the average time interval between the last ED visit and subsequent suicide death is even shorter for youth, ranging from three weeks to three months (Rhodes et al., 2019). In Canada, a study examined 8,851 suicide decedents and found half of them had visited an ED in the year before death, with approximately one third had died within the month following discharge (Vasiliadis et al., 2014). In addition, approximately 8-12% of those who present to EDs for nonmental health reasons often have silent suicidal ideation (Claassen & Larkin, 2005). This is partly due to patients' fear of stigmatization and subsequent difficulty communicating their feelings to the clinicians (Krychiw & Ward-Ciesielski, 2019). Moreover, a longitudinal study in the United States reported that 60% of 5,894 individuals who died of suicide had visited EDs within a year before their death, but half of these patients were not recognized as having mental health concerns during their visit (Ahmedani et al., 2014). In other words, when patients with SRTB visit EDs for reasons other than mental health concerns, it is not guaranteed that their suicide risk will be assessed or detected. In Canada, nearly 60% of people who died of suicide had visited EDs (Morrison & Laing, 2011), but the percentage of people who received mental health care is unknown. The ED is an important entry point for this population, and there is a critical need to improve care regarding suicide identification, treatment and disposition, so we do not miss the opportunities to prevent suicide.

1.7 Barriers to Optimal Suicide Prevention Care in the Emergency Department

Many patients do not receive appropriate care, or they receive unnecessary or even harmful care due to evidence to practice gaps (i.e., knowledge translation gaps) (Grimshaw et al., 2012). Patients with SRTB who present to the ED are not an exception (Alavi et al., 2017; Arias et al., 2017; Betz, Miller, et al., 2016; Betz, Kautzman, et al., 2018; Habis et al., 2007; Hickey et al., 2001; Kemball et al., 2008; McClatchey et al., 2019). There are both individual and organizational-level barriers that impede the optimal identification of those who are at risk and the delivery of suicide prevention care in the ED. Examples of individual-level barriers include clinicians' lack of knowledge and skills (Betz, Sullivan, et al., 2013; Conlon & O'Tuathail, 2012; Kishi et al., 2011; Petrik et al., 2015; Rebair & Hulatt, 2017; Roy et al., 2017; Vedana et al., 2017). Example of organizational-level barriers include a lack of time (Petrik et al., 2015; Roy et al., 2017; Vedana et al., 2017) and access to mental health consultations (Petrik et al., 2015; Roy et al., 2017). Chapter 2 will describe these multi-level barriers to ED-based suicide prevention in greater detail. Attention to these barriers is needed to improve the implementation of suicide prevention care in ED settings.

1.8 An Important Approach to Improve Suicide Prevention Provisions in the Emergency Department

To improve outcomes for people who present with SRTB to the EDs, we need to ensure that evidence-based practice is fully implemented. Supporting clinicians to make the desired behaviour change in accordance with evidence-based practice is an important step toward improving care (Ferlie & Shortell, 2001). Suicide prevention interventions are delivered in the context of provider-patient interactions, highlighting individual

clinician behaviours as proximal determinants of the quality of patient care. Tailored strategies that are intended to overcome prospectively identified barriers have high potential to improve clinical practice (Baker et al., 2010). However, it is easier said than done. There has been a frequent 'misfit' between the choices of implementation strategies (i.e., interventions to overcome barriers) and the problems that impede successful implementation (Wensing & Grol, 2019). In particular, organizational and system-level barriers have been overlooked even when they were prospectively identified (Bosch et al., 2007).

To avoid making similar mistakes, we need to strategically select implementation strategies (i.e., interventions to implement interventions) which address barriers that prevent desired behaviour change. Theory can aid understanding of the causal mechanisms of interventions, and it is argued that interventions are more likely to be successful if they target causal mechanisms and contextual factors for desired behaviour change (Michie et al., 2008). Moreover, there is a growing body of evidence that recommends the use of explicit theory to understand barriers, design interventions, and justify the interventions of choice (Davies et al., 2010; Liang et al., 2017).

1.8.1 Professional Behaviour Change

Understanding clinicians' behaviour and professional practice are complex as there are many factors that influence human behaviour (Grimshaw et al., 2001). Changes in clinicians' behaviour refer to changes in practice patterns, such as prescribing rates, risk screening, making referrals as noted in medical record/documentations or chart audits, and proxy measures of practice changes, generally referred to attitudes and knowledge assessed by interviews or surveys (Hakkennes & Green, 2006). Although,

changes in knowledge and attitudes do not guarantee a successful professional behaviour change (Johnson & May, 2015), they are individual-level factors that influence person's behaviour (Michie et al., 2011).

1.8.2 Behaviour Change Theory

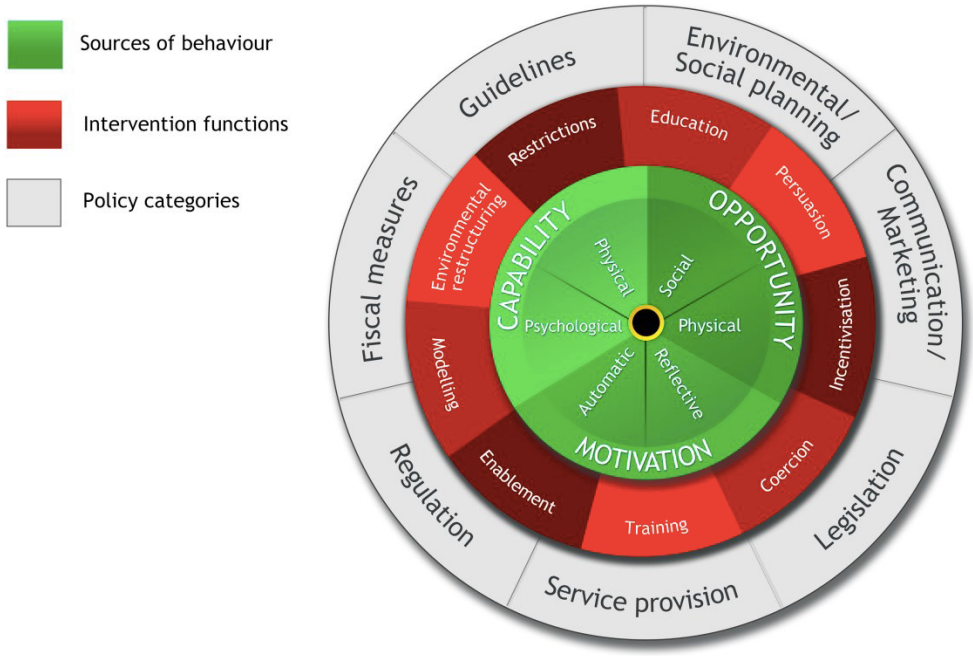


Figure 1-1. Behaviour Change Wheel (Michie et al., 2011)

The Behaviour Change Wheel (BCW) is a synthesis of 19 existing behaviour change frameworks; the BCW provides understanding of the factors that influence clinician behaviour change and underpin potential techniques to reinforce desired behaviour and behaviour change (Figure 1-1.) (Michie et al., 2011, 2014). The BCW encompasses three main components. The first is the Capability, Opportunity, Motivation-Behaviour (COM-B) model, which sits at the center of the wheel (Michie et al., 2011, 2014). The COM-B model assumes that human behaviour is influenced by the interaction between Capability, Opportunity and Motivation (Michie et al., 2011, 2014).

Often COM-B model is used to analyze barriers to desired behaviour change (Alexander et al., 2014; Cassidy et al., 2018; McDonagh et al., 2018). Second is the layer of nine intervention functions which can be used to change one or more of the barriers to the desired behaviour (Michie et al., 2011, 2014). The nine intervention functions include *Education, Training, Persuasion, Enablement, Restriction, Modelling, Environmental restructurings, Coercion and Incentivization* (Michie et al., 2011, 2014). Lastly, the third component is seven policy categories that could be used to deliver interventions, and they include *Environmental/social planning, Communication/marketing, Legislation, Service provision, Regulation, Fiscal measures and Guidelines* (Michie et al., 2011, 2014). The links between the COM-B, intervention functions and policy categories allow researchers to make theory-informed choices of intervention functions and methods of delivery according to the COM-B analysis of barriers to behaviour change (Michie et al., 2011, 2014). As such, the BCW is commonly used for designing interventions but also has been used to characterize existing interventions or policies to understand their functional and causal mechanism to change behaviour (Bannan & Tully, 2016; Curran et al., 2019). The BCW can provide insights into why and how suicide prevention interventions can work or cannot work in an ED context.

1.9 Research Problem

To close knowledge translation gaps in suicide prevention in the EDs, we need to support clinicians to make the required evidence-based behaviour change with strategies or interventions that target different individual and organizational-level barriers (Grimshaw et al., 2001; Johnson & May, 2015). Therefore, we need to explore existing suicide prevention interventions and examine if they comprise appropriate intervention

functions to overcome the barriers that impede optimal suicide prevention care in the EDs. We also need to map these interventions onto their functional categories and understand their characteristics to identify gaps.

1.10 Research Aim, Questions and Significance

Reviews of suicide interventions to date have yet to examine how existing suicide prevention interventions impact clinicians' behaviour change—change in practice patterns and proxy measures of behaviour change (Bennett et al., 2015; Johnston et al., 2019; Robinson et al., 2018; Stewart et al., 2002; Wilson et al., 2019). Efforts are needed to address this gap, and to our knowledge, the current study is the first review that will systematically and theoretically examine interventions that change ED clinicians' behaviour related to suicide prevention care.

The current study aims to systematically explore, characterize, and map all literature surrounding interventions that are designed to change ED clinicians' behaviour in relation to suicide prevention. Specifically, this scoping review seeks to identify any intervention that aims to alter the delivery of suicide prevention care by changing the behaviour of clinicians within an ED. Secondly, this review will utilize the BCW as a guiding theoretical framework to classify interventions following their functional mechanisms to change clinicians' behaviour. To address these aims, the following research questions will be explored:

1) What interventions have been implemented to change clinicians' behaviour in relation to suicide prevention care in the ED?
2) What are the outcome measures reported in these studies?

The findings will enable a theoretical understanding of the range of existing suicide prevention intervention literature. The use of the BCW can help us better understand how and why interventions can work to cause desired behaviour change. Interventions are believed to be successful if they target causal mechanisms of behaviour change, enabling clinicians to make required behaviour changes to provide optimal suicide prevention care in the EDs. Therefore, the analysis of the functional characteristics of the interventions will identify strengths and gaps in current interventions in relation to known barriers. The findings will serve as foundations for future research as it will provide pragmatic and theory-based recommendations for future intervention design and research.

CHAPTER TWO: LITERATURE REVIEW

The following chapter provides an overview of the literature on the current state of suicide prevention care provision in the EDs and discusses the applicability of behaviour change theory in intervention studies. This literature review is divided into three sections: (1) The provision of evidence-based suicide prevention care in the EDs; (2) Barriers to the optimal delivery and management of suicide prevention care in the EDs; (3) Utility of behaviour change theory in intervention studies in relation to clinician behaviour change and ED-based suicide prevention care.

2.1 Suicide Prevention Interventions in Emergency Department

Emergency department (ED) clinicians (e.g., physicians, nurses, nurse practitioners, social workers) have important responsibilities and opportunities to prevent suicide (Baca-García et al., 2004; Canner et al., 2018; Doshi et al., 2005). Suicide prevention care in the ED can be broadly categorized as risk screening and assessment, ED-based brief interventions (e.g., safety planning, counselling), disposition decision, discharge and follow-up; clinicians play a critical role in all stages of care (Betz & Boudreaux, 2016; Wilson et al., 2019).

2.1.1 Screening and Assessment

Suicide prevention starts with early identification of patients at risk. Screening for risk of suicide upon ED presentation is currently recommended as a best practice for suicide prevention (Betz & Boudreaux, 2016; Petrik et al., 2017; Setkowski et al., 2020, p. 1; Wilson et al., 2019). Clinicians should begin by ruling-out patients with negligible risk of suicide (i.e., true negatives) (Boudreaux & Horowitz, 2014) with the use of a specialized screening tool. A number of specialized tools have been developed to assess

suicide risk including the Decision Support Tool designed by the Suicide Prevention Resource Centre in collaboration with multidisciplinary experts and the major emergency medicine organizations; this tool can aid ED clinicians with decisions about the care and discharge of patients with suicide risk (Capoccia & Labre, 2015). There are six standard questions to quickly screen if a patient is at the risk of suicide (Capoccia & Labre, 2015), and this may be useful as a universal screening tool (Betz & Boudreaux, 2016). Another example specific to pediatric population is the HEADS-ED, and this tool encompasses the following items for investigation: home, education, activities and peers, drugs and alcohol, suicidality, emotions and behaviours, and discharge resources (Cappelli et al., 2012). The HEADS-ED is not designed solely for assessing the risk of suicide but provides structure for clinicians to obtain psychosocial history and helps with discharge planning (Cappelli et al., 2012). The HEADS-ED has shown promising quality of evidence in its accuracy in predicting admission to inpatient psychiatry when used in the EDs (Newton et al., 2017). American Academy of Pediatrics supports the use of specialized tools to screen and diagnose mental health problems (Committee on Pediatric Emergency Medicine, 2011). However, when considering methodological quality of existing tools, there is no quick and easy rule that can reliably predict the patient whose life is at imminent risk of suicide (Wilson et al., 2019). Therefore, tools should be used together with good clinical judgement (Ronquillo et al., 2012; Wilson et al., 2019).

Suicide risk screening and assessment should work in coordination (Boudreaux & Horowitz, 2014). After a patient is screened positive through initial suicide risk screening, clinicians need to perform a more comprehensive assessment to decide whether the patient needs a special mental health referral, ED-based brief interventions,

hospital admission or discharge home with follow-up care (Betz & Boudreaux, 2016). For example, when a special mental health consultation is not readily available, the ED clinicians can use the Suicide Assessment Five-Step Evaluation and Triage (SAFE-T), which is available in a pocket-card and smartphone application (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). The SAFE-T is publicly available, and provides an evidence-based guide for conducting a comprehensive suicide risk assessment, including identification of risk and protective factors, suicide inquiry, identification of interventions that matches the risk level, and appropriate documentation (SAMHSA, 2009). A practice review by Fowler (2012) recommends the use of this tool but suggests simultaneous thorough assessment skills and communication skills from clinicians. Another tool that is specifically evaluated in the ED is the Patient Safety Screener (PSS) developed by the Emergency Department Safety Assessment and Follow-up Evaluation (ED-SAFE) investigators, but sensitivity and specificity of the PSS are currently unknown (Wilson et al., 2019).

As seen, ED clinicians have the important responsibility of screening for and assessing risk of suicide, and this is currently recommended as best practice for suicide prevention (Betz & Boudreaux, 2016; Petrik et al., 2017; Wilson et al., 2019). In addition, a good clinical judgment should be complementary when using screening and assessment tools (Spence, 2019). Given the increase in the number of ED visits related to mental health concerns, especially among youth and young adults (Canadian Institute for Health Information, 2019), ED clinicians' critical responsibility for identifying those who are at risk of suicide has become more important than ever.

2.1.2 Emergency Department-based Brief Interventions

Suicide risk screening and assessment alone cannot successfully prevent suicide. Brief interventions are recommended in the ED for patients who are screened positive for suicide risk, and this can include safety planning and lethal means counselling among other strategies (Betz & Boudreaux, 2016; Wilson et al., 2019). These interventions can be helpful for preventing future self-harm, especially for patients who are being discharged home (Betz & Boudreaux, 2016; Wilson et al., 2019). Safety planning is recommended especially for people who present with a suicide attempt (Setkowski et al., 2020; Stanley & Brown, 2012) because they have the highest risk of subsequent suicide-related behaviour within the first three months following an attempt (Monti et al., 2003). Safety planning is not the same as 'contracting for safety.' Safety planning is rather a collaborative process between clinicians and a patient to develop a plan (on paper or smart phone application) of what to do when patient's symptoms worsens (Stanley & Brown, 2012). This plan also includes coping strategies, emergency contacts, hotlines, and local resources (Stanley & Brown, 2012). In one study, a safety planning intervention was implemented in the ED with a telephone follow-up call; this special type of brief intervention reduced subsequent suicide attempts and increased engagement with out-patient mental health treatment (Stanley et al., 2018). Similarly, a systematic review has found that ED-based transition interventions (i.e., intervention initiated in the ED and an extension of care post-discharge) had promising outcomes including treatment compliance and reduced risk of subsequent suicide in some cases (Newton et al., 2010). Lethal means counseling or reducing access to lethal means (e.g., toxic medication, firearm) are also important interventions for patients who are being discharged home

from the EDs (Betz & Boudreaux, 2016; Wilson et al., 2019). As access to lethal means have demonstrated population level increase in the risk of suicide, ED clinicians are recommended to assess, document and restrict access to lethal means amongst the high-risk patients (Wilson et al., 2019).

Pharmacotherapy is also recommended as an ED-based treatment (Wilson et al., 2019). Increased access to treatment of depression with antidepressants was found to be a potential suicide prevention strategy for youth (Bennett et al., 2015). Moreover, higher prescription rates of antidepressants correlate with decreasing suicide rates in both adults and youth (Mann et al., 2005; Weber et al., 2017); however, good clinical judgement is essential due to the risk of increased suicide rates in certain populations with the use of antidepressants (Courtet et al., 2017). Furthermore, the efficacy of pharmacotherapy remains controversial; particularly, Paroxetine (Paxil) use in teens has shown neither safe nor effective as initially reported (Le Noury et al., 2015). Therefore, when clinicians are prescribing antidepressants, it must be done with good clinical judgement and follow-up.

2.1.3 Disposition Decision and Discharge Planning

Emergency disposition decision (i.e., hospital admission or discharge) is an important aspect of suicide prevention. Admissions to a hospital are not always guaranteed nor warranted, and cannot always prevent future suicide attempts; however, admissions are recommended for adolescents with acute SRTB and noncompliance risk factors (e.g., depression) (Stewart et al., 2002). Also, psychiatric admissions for patients with acute crisis with imminent suicide risk is a typical disposition of the ED (Betz & Boudreaux, 2016). Patients with non-imminent suicide risk can be managed as out-patients depending on the availability of resources like outpatient clinics (Betz &

Boudreaux, 2016). For patients with non-imminent risk, clinicians need to provide supportive discharge with brief interventions such as safety planning and lethal means counselling (Betz & Boudreaux, 2016; Petrik et al., 2017; Wilson et al., 2019). This suggestion is consistent with the proposed priorities of suicide prevention from a recent Delphi study (Setkowski et al., 2020).

Psychiatric consultation or out-patient mental health referrals are important aspects of suicide prevention that ED clinicians need to organize prior to sending patients home. All patients with SRTB will be assessed by ED clinicians but not everyone will require a full psychiatric consultation, and a review of literature have outlined guidelines to aid clinical decisions for specialized mental health consultation (Stewart et al., 2002). In addition, clinicians should provide the number for suicide prevention hotlines, online chat resources, or connection to local resources before patients are discharged (Betz & Boudreaux, 2016). They are called "caring contacts" and have been coordinated by the ED clinicians with promising outcomes including reduction in suicide risk (Brown & Green, 2014).

Lastly, post-ED follow-up calls or visits are recommended as they result in fewer suicide attempts and suicide (Wilson et al., 2019). As part of a specialized suicide prevention model, such as the ED-SAFE, post-ED follow-up telephone calls were implemented in EDs upon patient discharge, and high-risk patients (>18 yrs) were followed up for one year (Boudreaux et al., 2013). During the one-year period, patients received up to 7 telephone calls for an assessment of SRTB, and patient's family member or significant other were also contacted to assess their concerns for the patient and received education regarding suicide and its risk factors (Boudreaux et al., 2013). When

suicide risk was detected during the follow-up duration, the patient was immediately connected to a suicide prevention hotline (Boudreaux et al., 2013). This follow-up intervention—which was initiated in the ED—has shown to reduce subsequent suicide attempts among high-risk patients (Miller et al., 2017), and similar findings have been found in earlier studies (Fleischmann et al., 2008; Vaiva et al., 2006). Recently, a meta-analysis result indicates that follow-up interventions can reduce the risk of repeat suicide attempt within 6 months in patients who present to an ED with suicide attempt that resulted in injury (Inagaki et al., 2019). Similarly, this type of intervention has shown promising outcomes among children and adolescents (<18yrs) (Newton et al., 2010).

2.1.4 Empathetic Care and Therapeutic Relationship

Based on the literature and expert opinions, empathetic care is recommended and required for all ED patients regardless of the type of suicide prevention interventions received (Betz & Boudreaux, 2016; Wilson et al., 2019). Patients with SRTB require an empathetic response from clinicians, and clinicians need to create an emotionally safe place for patients to communicate their needs without feeling judged (Wilson et al., 2019). Clinicians need to actively engage in communication with patients who may feel vulnerable and stigmatized, especially when specialized mental health evaluation is not readily available (Betz & Boudreaux, 2016; Wilson et al., 2019). Moreover, clinicians can normalize suicidal patients' situations by informing them that mental health concerns are common health problems (Wilson et al., 2019). These recommendations are made based on the assumption that some patients may not willingly communicate their mental health concerns or suicide risk during patient-provider interaction (Kemball et al., 2008).

To build strong therapeutic relationships with patients with SRTB, clinicians are encouraged to show empathy and attend to possible feelings of shame and blame perceived by the patient (Jobes & Ballard, 2011). Moreover, marginalized populations such as LGBTQ+ individuals who experience perceived stigma related to their sexual orientation have increased risk of SRTB (Kaniuka et al., 2019). Therefore, clinicians need to demonstrate cultural competency and prevent stigma. Negative attitudes towards mental health patients in the EDs can compromise clinicians' ability to properly assess and treat and may even lead to negative patient outcomes (Zun, 2012). Conversely, clinicians who show empathy and compassion encourage patients' disclosure about concerns, symptoms and behaviour, and are ultimately more effective at delivering care (Larson & Yao, 2005). In summary, clinicians need to effectively screen, assess and treat individuals who present with SRTB, and they also need to provide empathetic care and normalize suicide preventions for patients in the ED settings.

2.2. Barriers Experienced by the Emergency Department Clinicians to Effectively Deliver and Manage Suicide Prevention Care

Despite the availability of different ED-based suicide prevention interventions, there is a lack of documented use of assessment tools (Habis et al., 2007; McClatchey et al., 2019), assessment of suicide risk factors (Alavi et al., 2017; Hickey et al., 2001), assessment of lethal means amongst discharged patients with SRTB (Betz, Miller, et al., 2016; Betz, Kautzman, et al., 2018), follow-up rates (Inagaki et al., 2019), and utilization of mental health consultation (Arias et al., 2017; Kemball et al., 2008). This is not uncommon; many patients do not receive appropriate care or receive unnecessary care due to the evidence-practice gaps (i.e., knowledge translation) (Grimshaw, Eccles, Lavis,

Hill, & Squires, 2012). This knowledge translation gap is attributable to multiple individual and organizational-level barriers that hinder clinicians to deliver and optimally manage suicide prevention care in the EDs (Betz, Sullivan, et al., 2013; Betz, Wintersteen, et al., 2016; Conlon & O'Tuathail, 2012; Cullen et al., 2019; Habis et al., 2007; Petrik et al., 2015; Roy et al., 2017; Vedana et al., 2017). Efforts are needed to investigate, understand and address these barriers to support optimal delivery of ED-based suicide prevention care.

2.2.1 The COM-B Model and Theoretical Domains Framework

All of the interventions identified in **2.1** require clinicians' engagement in the desired behaviour. To understand the lack of engagement in the desired behaviour, a theoretical approach is imperative to identify the factors that influence behaviour change in the context in which intervention is being delivered (Eccles et al., 2005). The COM-B model that sits at the centre of the BCW can be used to characterize barriers to desired behaviours (Michie et al., 2011, 2014). The COM-B theorizes that Capability, Opportunity, and Motivation interact with each other to influence behaviour (Michie et al., 2011, 2014). As shown in Figure 2-1, single and double-sided arrows represent potential influence each component has for human behaviour (Michie et al., 2011, 2014). For example, Opportunity and Capability can influence Motivation, and also exhibition of Behaviour can influence Capability, Motivation, and Opportunity (Michie et al., 2011, 2014).

The COM-B analysis of barriers allows for contextualized understanding of behaviour and behaviour change (Michie et al., 2011, 2014). The Theoretical Domains Framework (TDF) (Cane et al., 2012) is a 14-domain behavioural framework that

expands on the COM-B model to capture potential determinants of behaviour change (Figure 2-2). It is vital to conduct a thorough behaviour analysis of the causes of behaviours, such as barriers and facilitators to engagement in the desired activity (Michie et al., 2014). As such, the COM-B model and TDF are useful frameworks to categorize barriers and understand how they impede desired behaviour change (Cane et al., 2012; Michie et al., 2011, 2014). The following section will categorize clinicians' barriers to optimal delivery and management of ED-based suicide prevention under COM-B and TDF domains.

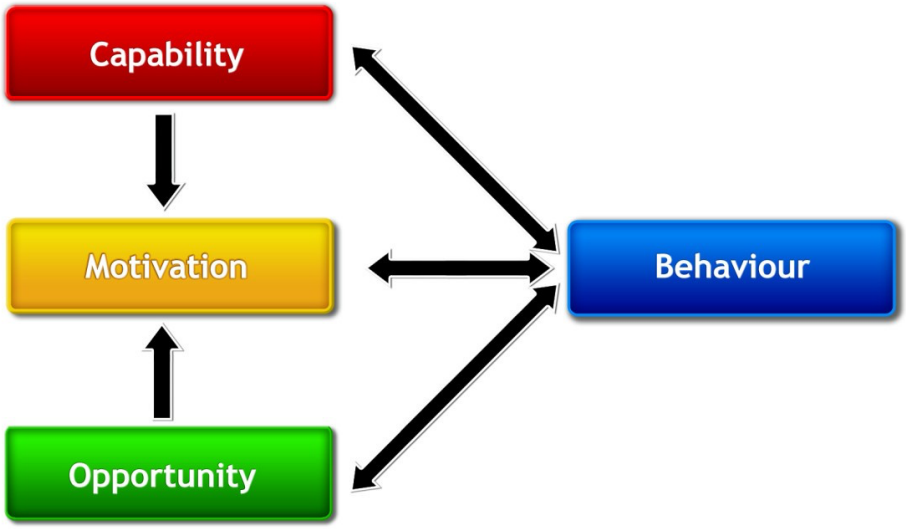


Figure 2-1. The COM-B System: A Framework for Understanding Behaviour (Michie et al., 2011)

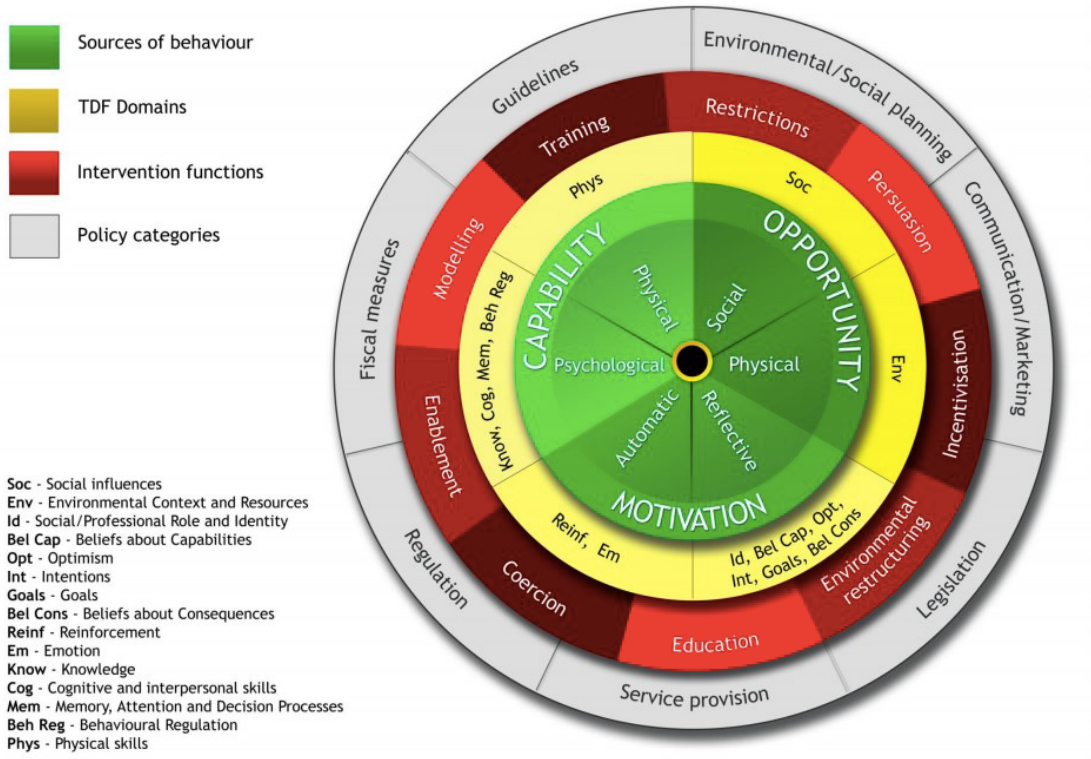


Figure 2-2. The BCW with the Theoretical Domains Framework (Michie et al., 2011, 2014).

2.2.2 Capability

Capability is defined as psychological and physical capability to elicit a desired behaviour (e.g., use of suicide risk assessment tool, assessing patients' access to lethal means) (Michie et al., 2011, 2014). Capability includes the TDF domains of *knowledge* and *skills*, and barriers related to *knowledge* includes a lack of awareness, understanding or information (Cane et al., 2012). Barriers related to *skills* describe competencies and proficiency needed for delivering evidence-based suicide prevention care (Cane et al., 2012).

2.2.2.1 Knowledge. A lack of knowledge has been identified as a barrier to optimal suicide prevention amongst the ED clinicians (Betz, Sullivan, et al., 2013;

Conlon & O'Tuathail, 2012; Gordon, 2012; Vedana et al., 2017). Traditionally, ED physicians do not receive comprehensive education on mental health during their residency training compared to physiatrists. This differs from other types of medical specialities, such as psychiatrists who receive specific mental health training. The dominant biomedical practice in EDs maybe attributable to this lack of training resources to support the ED clinicians regarding mental health care (Shin et al., 2020). As a result, ED physicians may rely heavily on the mental health consultants' recommendations when making disposition decisions for patients who present with SRTB (Betz, Wintersteen, et al., 2016). This is different from other high-acuity emergency presentations like stroke, in which emergency physicians are trained to determine—according to their initial assessment—the need for necessary specialty consultations (Betz, Wintersteen, et al., 2016).

Similarly, a study in Japan found that emergency nurses are less likely to exhibit favorable attitudes toward patients with SRTB compared to psychiatric nurses, and suggested that negative attitudes may be attributable to a lack of knowledge about SRTB (Kishi et al., 2011). ED clinicians are aware of this barrier as they have voiced that a lack of knowledge is a key issue, and they are concerned about the inadequate management of mental health patients (Jelinek et al., 2013). Similarly, a lack of knowledge is a common barrier to the assessment of suicide risk amongst different health care disciplines, including oncologists and oncology nurses (Granek et al., 2018).

2.2.2.2 Skills. A lack of skills and expertise have prevented clinicians from providing appropriate resources or creating safety plans for patients who present with SRTB (Betz, Sullivan, et al., 2013). One study by Petrik (2015) had an interesting

finding: ED clinicians reported confidence in their initial screening skills, but there existed gaps in the skills to perform further assessments such as lethal means counselling. Clinicians are capable of screening for people who are at risk of suicide; however, they are not skilled in differentiating those with imminent versus non-imminent risk of suicide, subsequently influencing their discharge planning such as counselling and/or mental health referrals (Petrik et al., 2015). Several studies also found that ED clinicians are aware of their lack of skills to provide care to patients who are at risk of suicide (Rebair & Hulatt, 2017; Roy et al., 2017; Vedana et al., 2017). Further, ED clinicians consistently have voiced the need for more training around the care of mental health patients (Cullen et al., 2019; Koning et al., 2018; Zun, 2012).

2.2.3 Motivation

Motivation refers to brain processes that endorse or inhibit behaviour, including habitual, emotional, analytical decision processes; they include both reflective motivation (i.e., beliefs and intentions) and automatic motivation (i.e., emotion) (Michie et al., 2011, 2014). The TDF domain of motivation includes *beliefs about capabilities, emotion,* and *beliefs about consequences* (Cane et al., 2012). *Beliefs about capabilities* is defined as acceptance of reality, validity about ability; barriers related to this domain includes lack of confidence, self-efficacy, self-esteem and professional confidence (Cane et al., 2012). Emotion is related to complex reaction pattern, and the specific quality of the emotion (e.g., fear, shame) is determined by the specific significance of the event (Cane et al., 2012). Barriers related to *emotion* include fear, anxiety and stress (Cane et al., 2012). *Beliefs about consequences* includes motivators and deterrence associated with the impact of engaging in a behaviour and the anticipated results (Cane et al., 2012).

2.2.3.1 Beliefs about Capabilities. A lack of confidence and perceived knowledge have hindered the management of suicide prevention care (Chapman & Martin, 2014; Fry et al., 2019; McAllister et al., 2002; Petrik et al., 2015). An Australian study conducted a multi-center survey to explore ED nurses' confidence, and only 11% of 136 respondents have reported feeling confident in managing SRB (Fry et al., 2019). In another American study, ED clinicians have expressed that the lack of continuing education to "feel knowledgeable" when caring for patients with SRTB have resulted in "fear" and "discomfort" (Petrik et al., 2015). This belief about their own capabilities has subsequently contributed to clinicians' preference to consult and reliance on mental health specialists for suicide risk assessment (Petrik et al., 2015).

2.2.3.2 Emotion. Individual ED clinician's attitude towards patients with SRTB influence suicide prevention care provisions. In the literature, there has been mixed attitudes—presence of both positive and negative attitudes—amongst the ED clinicians against patients with SRTB (Conlon & O'Tuathail, 2012; Giacchero Vedana et al., 2017; Herron et al., 2001; McCann et al., 2007; Ouzouni, 2012; Rayner et al., 2019; Suokas et al., 2008). Particularly, repeated ED presentations due to self-harm have caused feelings of frustration and powerlessness amongst the ED nurses (Conlon & O'Tuathail, 2012). Negative attitudes can be exemplified as avoidance or rejection (Saunders et al., 2012) especially when clinicians find patients challenging to treat, and negative attitudes have even shown to result in discriminatory behaviours in an earlier study (Ellsworth, 1965). Mental health stigma still exists in today's societies, and efforts are needed to address negative attitudes and prevent stigmatizing behaviours against patients with SRTB in the

EDs. This can be prevented, as found in one study, negative attitude has seemed to be attributable to lack of suicide prevention training (Petrik et al., 2015).

2.2.3.3 Beliefs About Consequences. Skepticism about the preventability of suicide is a barrier to suicide prevention (Betz, Brooks-Russell, et al., 2018; Betz, Miller, et al., 2013). A large proportion of ED nurse leaders believe that suicide is not preventable despite interventions in the ED, although many of them simultaneously believe lethal means restrictions or counselling are effective ways to prevent suicide (Betz, Brooks-Russell, et al., 2018). A similar estimate of front-line ED physicians and nurses also have shown skepticism of suicide preventability (Betz, Miller, et al., 2013). The conflict between the skepticism of the preventability of suicide and perceived effectiveness of suicide prevention may reflect a lack of positive feedback provided to clinicians about the patients who recover and thrive after a suicide attempt, and instead, clinicians continue to care for chronic ED users who re-attempt suicide (Betz, Brooks-Russell, et al., 2018). Further, a national survey found that at least one-third of Americans are skeptical about the effectiveness of suicide prevention that relies on lethal means restriction because they believe individuals with suicide ideation are likely to find alternative means to end their lives (Miller et al., 2006). ED clinicians, therefore, may have a bias toward patients who repeatedly present with SRTB due to the belief of the inevitability of suicide despite ED-based interventions. Consistent with the current literature, beliefs about the benefits of new practice guideline (Melnyk et al., 2004; Ploeg et al., 2007) or an initial 'buy-in' from the clinicians (de Wit et al., 2018) are some of the factors that influence implementation in various health care settings.

2.2.4 Opportunity

According to the COM-B, opportunity is defined as social and environmental factors external to an individual that influence an engagement in the desired behaviour (Michie et al., 2011, 2014). Opportunity includes TDF domains of *environmental context and resources*, and *social influences* (Cane et al., 2012). *Environmental context and resources* refer to external factors of clinicians that impedes desired behaviour change (Cane et al., 2012). Barriers related to this domain includes any circumstance of an individual's situation or environment (e.g., salient event, environmental stressors) that discourages the advancement of skills and abilities, independence, competence, and adaptive behaviour (Cane et al., 2012). *Social influence* is related to interpersonal processes within social structures (emergency department) that can change individuals to change thoughts, feelings and behaviours (Cane et al., 2012).

2.2.4.1 Environmental Context and Resources. The time pressure that ED clinicians experience—such as the expectation for clinicians to treat numerous high acuity patients and to reduce wait-times and duration of ED visits—has emerged as a predominant barrier to the provision of optimal suicide prevention care (Betz et al., 2010; Conlon & O'Tuathail, 2012; Petrik et al., 2015; Roy et al., 2017). Similarly, limited time has been a barrier to building therapeutic relationship with patients among the emergency nurses (Vedana et al., 2017), which can impede patient-clinician communications. Time pressure also seems to be a source of stress among the ED clinicians (Johnston et al., 2016), and continues to be a common barrier to providing optimal mental health care (Dombagolla et al., 2019; Marynowski-Traczyk & Broadbent, 2011). Further, lack of

time has been a consistent barrier to implementing other evidence-based practice in the EDs (Duignan & Dunn, 2008; MacWilliams et al., 2017; Prochazka et al., 1995).

It is concerning to note that clinicians from four Canadian EDs identified patient characteristics—suicidal ideation itself—as a barrier to effectively manage care (Fleury et al., 2019). A patient's inability or unwillingness to participate in suicide risk assessment procedures has been another barrier experienced by the clinicians (Petrik et al., 2015). Also, when a patient presents with co-occurring acute medical issues due to alcohol or drugs, it hinders the patient's ability to appropriately answer during the suicide risk assessment; this subsequently creates a challenging situation for clinicians to perform accurate assessment (Petrik et al., 2015). Similarly, patient characteristics, such as presentation with co-occurring mental health disease has been a barrier to mental health management in the EDs (Fleury et al., 2019).

A lack of psychiatric consultation services is another barrier to optimal suicide prevention in the ED. An Australian national survey of ED nurses and leaders have identified the need for increased access to mental health care and staff within the hospital and in community to improve quality of ED care for patients who present with suicide attempt or self-harm (Cullen et al., 2019). Similarly, American ED clinicians have reported that their access to psychiatric consultation services is limited and there is a scarcity of post-ED care options for patients who are at risk of suicide (Petrik et al., 2015). This can negatively impact decisions for discharge planning and may prevent clinicians from to assessing patients for risk of suicide (Petrik et al., 2015). Likewise, one study found clinicians' negative attitudes toward universal screening in the ED; clinicians

expressed concerns for creating undue burdens of universal screening, especially when intervention resources are scarce (Roy et al., 2017).

2.2.4.2 Social Influences. Shared expectations within an organization will arise over history and a common experience (Schein, 2004). The ED clinicians share certain beliefs and values regarding emergency care that are influenced by the historical and institutional expectations of the ED practice. Traditionally, ED clinicians have been educated and trained to manage physical illnesses and trauma. Consequently, EDs are often perceived as places for treating life-threatening medical crises, such as heart attacks and strokes (Muntlin et al., 2010; Nyström, Dahlberg, & Carlsson, 2003). In turn, a patient who does not require urgent medical attention is labelled as an "inappropriate attendee" (Nyström et al., 2003, p. 761). There are no studies that examined ED clinicians' stigmatizing behaviours toward patients with SRTB, but one study showed that ED clinicians have labeled patients with mental illnesses as "time-consuming," "unpredictable," and "unfixable" (Sukhera et al., 2017, p. 166). These labelling can contribute to negative attitudes among the ED clinicians, and can negatively influence the quality of suicide prevention care. Moreover, efficiency of care and high technical skills are well-valued amongst the ED clinicians due to the time-sensitive and chaotic nature of emergency care. As a result, efficient practice is an invisible norm (Webster et al., 2015), and many ED clinicians believe that they do not have time to build relationships with patients (Kuhlmann et al., 2009; Nyström et al., 2003).

ED clinicians play a critical role in every step of suicide prevention care; however, evidence to guide each practice is not always well implemented in ED settings. As described above, multiple barriers have been identified and categorized according to

the COM-B and TDF framework. There are barriers related to Capability, Motivation and Opportunity that impede clinicians from providing optimal suicide prevention care. Moreover, multiple barriers are interrelated and negatively influence thoughts, feelings or behaviour. For example, lack of knowledge (Capability) amongst the ED clinicians was associated with negative attitudes towards suicide prevention care (Motivation). Although causality cannot be determined, barriers are contributing to evidence-practice gaps in the ED suicide prevention. To support optimal suicide prevention care in the ED, we need interventions that can overcome these multi-level barriers.

2.3 Need for a Theoretical Approach to Suicide Prevention in the Emergency Department

The following section explores the current synthesis literature of suicide prevention interventions that are specific to ED settings. Gaps are identified and a theoretical approach to improving suicide prevention will be justified through examining the utility of behaviour change theory in relation to clinician behaviour change.

2.3.1 ED-based Suicide Prevention Interventions Synthesis Literature

In the suicide prevention synthesis literature, systematic reviews have shown statistically significant but minimal effectiveness of ED-based suicide interventions. A recent systematic review of brief interventions implemented in the EDs has found promising effectiveness in reducing suicide and suicide attempt across all ages although the evidence base is small containing four studies (McCabe et al., 2018). In another review, a meta-analysis of a wide range of youth (<18yrs) suicide interventions showed minimal evidence that interventions reduced repeated self-harm in clinical settings (i.e., emergency department, community and in-patient departments) (Robinson et al., 2018).

In this review, self-harm was measured continuously and the interventions resulted in reduced number of subsequent self-harm, but there was no evidence of intervention effectiveness when self-harm was measured dichotomously (Robinson et al., 2018). Similarly, Johnston et al (2019)—although not a formal meta-analysis—found limited effectiveness of the ED-based interventions on reducing suicide and self-harm amongst an adult population. Lastly, interventions initiated in the ED and extend care post discharge (i.e., follow-up) have shown to reduce suicide-related outcomes and increase ED treatment adherence by patients who are younger than 18 years of age (Newton et al., 2010). More recently, a meta-analysis of follow-up interventions (9 studies) initiated in the EDs has shown to prevent repeat suicide attempt within 12 months in patients of all ages who present to EDs with injury caused by suicide attempt (Inagaki et al., 2015). Four years later, Inagaki et al. (2019) added 2 trials and conducted another meta-analysis; interventions were found to be effective in preventing subsequent suicide attempt within 6 months post ED visit among the same population group. However, Inagaki et al. (2015) suggested an opportunity for improving professional adherence to intervention and maximize interventions' effectiveness (Inagaki et al., 2015). Implementation evaluation will be useful as it focuses on how well the intervention was delivered to impact selected health outcomes (Moore et al., 2015). This is consistent with what a systematic review of reviews of youth suicide prevention plan for Canada have suggested—the need for implementation to be linked to rigorous evaluation (Bennett et al., 2015). Lastly, whether these interventions can prevent actual suicide deaths has not yet been confirmed (Inagaki et al., 2015, 2019; Johnston et al., 2019; McCabe et al., 2018; Newton et al., 2010; Robinson et al., 2018).

2.3.2 Possible Reasons for Limited Effectiveness

Limited effectiveness of interventions may be in part due to multiple barriers in EDs that hinder successful implementation (Grol & Grimshaw, 2003). Since there are multiple barriers to suicide prevention (section **2.2**), there are likely challenges in fully implementing these interventions into practice, thus limiting the desired outcome. Another reason for a limited effect of interventions can be attributed to a lack of reported theoretical rationale, which hinders design, replication, implementation, hence the inability to produce the maximum benefit (Grimshaw et al., 2004; Michie et al., 2005). Further, insufficient theory-informed choice of interventions that link interventions to implementation strategies may account for limited effectiveness of interventions (Sales et al., 2006). As such, there has been a frequent 'misfit' between the implementation strategies (i.e., interventions to overcome barriers) and the barriers that impede implementation across disciplines (Wensing & Grol, 2019). Investigation of the theoretical underpinnings of ED-based suicide prevention interventions has been absent in the suicide prevention synthesis literature (Inagaki et al., 2015, 2019; Johnston et al., 2019; McCabe et al., 2018; Newton et al., 2010; Robinson et al., 2018) despite multi-level barriers identified in **2.2**. Currently, it is unknown whether these interventions in **2.1** are appropriately paired with theory-informed strategy for implementation which can overcome barriers outlined in **2.2**.

2.3.3 Importance of a Theoretical Approach to Close Evidence-Practice Gap

A theoretical approach to intervention studies is important because—without a theory—it is challenging to obtain a comprehensive understanding of the context in which interventions are being implemented. As a result, interventions may be adopted or

adapted with poor fidelity due to contextual barriers (Bauer et al., 2015). One important approach to close the evidence-practice gaps is to support clinicians to make the desired behaviour change (Ferlie & Shortell, 2001; Woolf, 2008). This involves providing system-level as well as individual-level supports to promote desired behaviours of clinicians (Woolf, 2008). To aid interventions to elicit maximal effect, implementation strategies (i.e., interventions to implement evidence-based practice) should be theory-informed to target different individual and organizational-level barriers to change professional practice (Baker et al., 2010; Grimshaw et al., 2001; Johnson & May, 2015). Further, exploring the mechanisms of interventions that cause change is critical to understand how specific interventions can produce the desired effect and might be replicated (Moore et al., 2015).

2.3.4 Utility of the Behaviour Change Wheel

There is an increase in recognition that a design of behaviour change interventions should be based on relevant theories (Eccles et al., 2005; The Improved Clinical Effectiveness through Behavioural Research Group (ICEBeRG), 2006). In response to a growing body of evidence that recommends the use of explicit theory to understand barriers, design interventions, and justify selection of interventions (Davies et al., 2010; Liang et al., 2017), the BCW have been commonly used to improve health care practice (Cadogan et al., 2016) and health behaviours (Murtagh et al., 2018). Clinicians' behaviours have been investigated using the BCW in a range of disciplines (Chiang et al., 2018; Laba et al., 2013), and the BCW also has been used to characterize existing interventions or policies to understand their functional and causal mechanism to change

behaviour (Bannan & Tully, 2016; J. A. Curran et al., 2019; Murphy et al., 2017; Steinmo et al., 2015).

2.3.5 Intervention Functions within the BCW

The BCW links COM-B components to nine intervention functions—*Education, Training, Persuasion, Enablement, Restriction, Modelling, Environmental restructurings, Coercion and Incentivization* (Figure 2-2) (Michie et al., 2011, 2014). This linkage can identify behavioural determinants and intervention functions that are most appropriate and effective for bringing the desired change (Michie et al., 2011, 2014). For example, there are multiple barriers, such as lack of skills and time, to the delivery of optimal suicide prevention care, and interventions—theoretically speaking—should perform more than one behaviour changes related to Capability (e.g., lack of skills) and Opportunity (e.g., lack of time) (Michie et al., 2011, 2014). As such, the BCW can aid understanding of the cause of the behaviour, and it is argued that behaviour change interventions are more likely to be successful if interventions target causal mechanisms of the desired change (Michie et al., 2008).

2.3.6 Use of the BCW in Intervention Study

Retrospective application of the BCW to characterize existing interventions can provide theory-informed understanding of how and why interventions can work, and provide recommendations for future research, policy, practice change and improvement. Curran and colleague's (2019) systematic review and narrative synthesis of discharge communication utilized the BCW to characterize existing interventions according to intervention function types. They found that interventions consisted of one to four different types of intervention functions; the majority of strategies to improve discharge

communication was found to be educational and employed a single intervention function type (Curran et al., 2019). Further, amongst the interventions involving two intervention functions, education was a common function with second function (e.g., *Environment restructuring*) augmented to overcome existing barriers (Curran et al., 2019). As such, they were able to systematically describe interventions using common behaviour change theory terminologies, identify gaps in the existing intervention, and provide theory-based future directions for intervention design and policy (Curran et al., 2019).

2.3.7 Benefits of Using the BCW to Understand How Interventions Influence Behaviour

There has been a frequent 'misfit' between the implementation strategies and barriers to successful implementation (Wensing & Grol, 2019). In particular, organizational and system-level barriers have been overlooked even when they were identified beforehand (Bosch et al., 2007). To avoid making similar mistakes, we need to be selective of implementation strategy in which they can address barriers to desired behaviour change. Behaviour change theory can aid understanding of the causal mechanisms of interventions (Michie et al., 2011, 2014), and this is consistent with the growing body of evidence which recommends the use of theory to understand barriers, design interventions, and explicitly justify the interventions of choice (Davies et al., 2010; Liang et al., 2017).

Identified suicide prevention interventions in **2.1** are to be delivered in the context of ED provider-patient interaction, highlighting clinicians' behaviours as proximal determinants of the quality of patient care. Considering the critical responsibilities and opportunities that ED clinicians have in suicide prevention, there is an urgent need to

close evidence-practice gaps in suicide prevention in the ED. One approach to achieve this goal is to support clinicians make the required behaviour changes, and therefore, we need strategies that target individual and organizational-level barriers to change clinician behaviour (Grimshaw et al., 2001; Johnson & May, 2015). However, to date, reviews of suicide interventions have yet to examine the provider or organizational-level interventions that target clinicians and influences that they have on clinicians' behaviour change in relation to suicide prevention care in EDs (Inagaki et al., 2015, 2019; Johnston et al., 2019; McCabe et al., 2018; Newton et al., 2010; Robinson et al., 2018).

To close this gap in the synthesis literature, we first need a systematic approach to explore the range of existing suicide prevention interventions that are designed to improve care provisions by changing clinician's behaviour and understand interventions' functional mechanisms to elicit target behaviour changes. Further, we need to examine if existing interventions consist of appropriate functional characteristics to overcome the barriers that impede suicide prevention care in the EDs (e.g., lack of knowledge and time). By retrospectively characterising existing interventions, we will gain a better understanding of the nature of behaviour to be changed and how interventions can cause desired behaviour changes in the ED context. Further, by identifying mechanisms (i.e., intervention functions) and making connections to the prospective COM-B analysis of barriers, we will identify gaps and targets for improvement in the existing interventions.

2.4 Summary and the Identified Gap

This literature review outlines the current evidence-based suicide prevention interventions in the EDs and highlights critical responsibilities and opportunities that ED clinicians have in suicide prevention. However, the current evidence base is not always

translated into ED practice, and there are multiple barriers for clinicians to provide the optimal suicide prevention care. Further, limited effects of reducing suicide-related outcomes are discussed, and this may be in part due to evidence-practice gaps and a lack of theoretical approach to intervention designs. Lastly, this review demonstrates the utility of behaviour change theory to retrospectively analyze existing interventions to understand their functional and causal mechanism to change behaviour.

Overall, there is a significant gap in the suicide intervention synthesis literature; reviews to date have yet to systematically and theoretically examine interventions' functional characteristics and how they influence ED clinicians' behaviours in relation to suicide prevention care. To close the evidence-practice gap in ED-based suicide prevention, we need to support clinicians to make the required behaviour changes. Therefore, we need to explore the range of available interventions that alter the delivery of suicide prevention care and change care management behaviour of clinicians within an ED, rather than solely examining patient-level interventions. Further, we need to systematically and theoretically examine the scope of interventions' functional mechanisms in which they propose to change clinicians' behaviour, and their potential to address identified barriers that impede suicide prevention. As such, the use of the BCW in this current study will allow for a detailed characterization of functions and describe interventions using common behaviour change theory terminologies. The application of the BCW will provide a theoretical understanding of how and why interventions can work to cause desired clinician behaviour changes in relation to suicide prevention. Interventions are believed to be successful if they target causal mechanisms of behaviour change, enabling clinicians to make the required behaviour change to provide optimal

suicide prevention care in the EDs. Therefore, the analysis of the interventions' functional characteristics will identify strengths and gaps amongst the existing interventions in relation to known barriers. Lastly, the findings will provide pragmatic and theory-based recommendations for future intervention design and research. These recommendations will be relevant to researchers, clinicians, health administrators and ultimately to patients living with SRTB who seek help in the EDs.

CHAPTER THREE: THE SCOPING REVIEW PROTOCOL

Scoping reviews aim to explore, map and summarize the extent of published and unpublished literature (Arksey & O'Malley, 2005; Peters et al., 2017; Tricco et al., 2016). As such, the scoping review methodology is appropriate for this review because it aimed to identify and map the range of suicide prevention literature, rather than to assess the effectiveness. Secondly, when the literature is heterogenous in nature, such as the suicide prevention interventions, the scoping review methodology is appropriate (Mays et al., 2001). To ensure trustworthiness, replicability and rigour, this review adhered to the Joanna Briggs Institute (JBI) scoping review methodology (Peters et al., 2017). JBI's scoping review methodology is internationally recognized, and its framework is based on Arksey and O'Malley's work (2005) advanced by Levac and colleagues (2010). Moreover, all JBI scoping reviews begin with the development of a priori protocol with inclusion and exclusion criteria that clearly reflect the review questions. JBI peer-reviews all protocols and the full scoping review, and any changes from the protocols must be addressed. Both my protocol and the full review adhered to the guidelines outlined in the JBI manual (Peters et al., 2017), and therefore, ensured methodological consistency and transparency. Broadly, the six major steps in the scoping review methods were: 1) Formulating the research objective and questions; 2) Searching for relevant studies; 3) Screening and selecting relevant studies; 4) Extracting data; 5) Analyzing data; and 6) Summarizing and presenting key findings.

JBI *Database of Systematic Reviews and Implementation Reports*, Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health

Literature (CINAHL), PROSPERO and PubMed were searched in April 2020, and no current or underway scoping systematic reviews on the topic were identified.

3.1 Review Questions

This scoping review aimed to address two primary questions:

1) What interventions have been implemented to change clinicians' behaviour in relation to suicide prevention care in the ED?
2) What are the outcome measures reported in these studies?

3.2 Inclusion Criteria

As recommended by JBI, the "PCC" mnemonic—participants, concepts, context—was be used construct the inclusion criteria for this scoping review.

3.2.1 Participants

This review considered studies that included ED clinicians—all health care providers who deliver direct care to patients presenting to EDs. A wide range of health care professionals who provide direct care in clinical settings (physicians, nurses, nurse practitioners, physician assistants, social workers, medical residents etc.) have been commonly referred as 'clinicians' in literature (Bachner-Melman et al., 2020; Im, Chary, Condella, et al.2020). As such, the broad term, 'clinicians,' was adopted in this review. There were no exclusion criteria based on age, gender, or years of clinical experience. Therefore, this review also included ED specific health care trainees and learners (i.e., emergency medicine residents).

3.2.2 Concepts

Key concepts of this scoping review included interventions designed to change ED clinicians' behaviour in relation to suicide prevention care. There are many ways to

change human behaviour; to name a few, clinicians' behaviour can be changed by educational workshops or by introducing a new clinical pathway. This scoping review sought to identify any intervention that changes ED clinicians' behaviour regardless of its type or function. Additionally, interventions must aim to change clinicians' behaviour related to suicide prevention for any population of patients presenting with suicide-related thoughts and behaviours (SRTB).

Changes in clinicians' behaviour refer to changes in practice patterns, such as prescribing rates, risk screening, making referrals as noted in medical record/documentations or chart audits, and proxy measures of practice changes, generally refer to attitudes and knowledge assessed by interviews or surveys (Hakkennes & Green, 2006). Although, changes in knowledge and attitudes do not guarantee successful professional behaviour change (Johnson & May, 2015), they are individual factors that influence one's behaviour (Michie et al., 2011). Therefore, this review considered studies of interventions that influence measures of knowledge, attitude and practice change. SRTB represents a spectrum of ideation, communication, behaviours and attempt with having casual to persistent suicidal thoughts with actual, undetermined or no suicidal intent (Silverman et al., 2007b). Interventions to change clinicians' practice for any sub-category of SRTB were considered. Studies were excluded if they exclusively examined intervention processes and outcome measures at the patient level; such examples included studies reporting the efficacy of a risk assessment tool. However, these studies were included if they reported the impact that interventions had on clinicians.

3.2.3 Context

This review focused on suicide prevention interventions based in EDs. All EDs in any country were eligible for this review as long as the study was written in English. Pediatric, adult and other general EDs were all eligible for inclusion. EDs with or without access to onsite psychiatric emergency consultations were both eligible for inclusion. There were no exclusion criteria regarding the geographical settings of EDs (e.g., urban, suburban, rural).

3.3 Types of Sources

This scoping review considered both published and unpublished literature. Eligible sources considered primary research of any design, reviews and meta-analyses, reports, opinion papers, conference proceedings and publication by relevant national and international websites of health organizations and agencies. The method to identify relevant websites are detailed in **3.5**. Studies published in English were included. No date parameters were applied.

3.4 Search Strategy

As recommended in all JBI reviews, a three-step search strategy was utilized in consultation with a JBI-trained librarian scientist. We conducted an initial search of PubMed and Cumulative Index of Nursing and Allied Health Literature (CINAHL), followed by an analysis of the text words contained in the title and abstract and the index terms used to describe the articles. A second search using all identified keywords and index terms was applied across all included databases. Thirdly, the reference list of the sources that have been included in the reviews were hand-searched for additional articles. When relevant, authors of primary sources or reviews were contacted for further

information. Key journals related to mental health and emergency services were hand-searched for eligible studies. Final search strategies can be found in Appendix.1.

3.5 Information Sources

The databases included PubMed, PsycInfo, CINAHL and Embase. Grey literature search included targeted Google search, ProQuest Thesis and Global, Scopus for conference papers. International and national emergency services organizational websites were identified to locate reports and other eligible sources. I followed the two-step method by Godin and colleagues (2015) to conduct targeted Google searches and identified websites of relevant health organizations and agencies. Firstly, I conducted ten unique Google searches with different combinations of keywords and reviewed each search's first 100 items to identify relevant websites and organizations publishing information sources on the suicide prevention interventions that support ED clinicians. Next, I hand-searched each of the relevant websites for potentially relevant documents (e.g. web pages, reports). Within this step, each website and the date of each search were documented. This two-step method targeted both national and international websites. More detail on the results of ten searches can be found in Appendix 2. Lastly, I hand-searched three journals (i.e., *Journal of Mental Health, Journal of Emergency Medicine, Journal of Emergency Nursing*) to identify any eligible studies.

3.6 Study Selection

All identified citations were collated and uploaded into Covidence, an online software program (*Covidence Systematic Review Software*, 2019), and duplicates were automatically removed. A pair of two independent reviewers then screened and assessed titles and abstracts against the pre-defined inclusion criteria. Next, potentially relevant

studies were retrieved in full text in Covidence. After screening titles and abstracts, two independent reviewers assessed the full text of relevant studies in detail against the inclusion criteria. Reasons for exclusion of full-text studies were recorded. Any discrepancies between the reviewers at each stage of the study selection process was resolved through discussion or with a third reviewer. The search results are reported and presented in a PRISMA flow diagram (Moher et al., 2010) in Chapter 4.

The primary author conducted critical appraisal using critical appraisal checklists from Joanna Briggs Institute (JBI, n.d.), Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2019) and Quality Improvement Minimum Quality Criteria Set (Hempel et al., 2015). Then a secondary reviewer verified the critical scores for all appraised studies. Conflicts were resolved through discussion or with a third reviewer. The quality of the studies did not serve as an inclusion criterion. Although critical appraisal is not a requirement for a scoping review, it was done to identify gaps in the quality of evidence.

3.7 Data Extraction

A data extraction instrument (Appendix 4) was developed to extract the following study information:

- Authors
- Year of publication
- Study objective
- Study type
- Literature type
- Study sample characteristics (ED clinician discipline)

- Country of origin
- ED type
- Geographical setting (i.e., urban suburban, rural)
- Methodology/methods
- Reported use of a theory or framework for the design of intervention
- Definitions used in the study to describe suicide-related thoughts and behaviours (SRTB)
- Description of intervention
- Intervention target(s) (record primary and secondary target when appropriate)
- Reported implementation strategy
- Reported outcomes measures (i.e., described outcomes and/or measurement tools)
- Direction of effect outcomes (i.e., positive or negative)
- Study main findings and conclusion

A pair of two reviewers independently extracted data using the developed extraction tool. As suggested by Arksey and O'Malley (2005), two reviewers pilot tested the extraction tool on three studies to ensure all relevant results were extracted. Two reviewers met after extracting data for the first three studies to identify any discrepancies and ensure consistency of data extraction. After piloting the tool, I decided to extract the type of EDs (e.g., Pediatrics, General) involved in the study, and no other major changes took place. After finalizing the extraction tool, the remaining data were extracted by a pair of two reviewers independently. Conflicts in the data extraction were resolved through discussion or with a third reviewer. Authors of papers were contacted to request additional data, where required. For example, authors of one paper was contacted to

clarify whether liaison psychiatry service officers were located within the EDs (Opmeer et al., 2017).

3.8 Data Analysis

3.8.1 Application of the BCW to Characterize Interventions

This review used the BCW (Michie et al., 2011, 2014) as a guiding framework to classify identified interventions. The coding scheme (Appendix 5) was directly developed from Michie et al., (2011, 2014) to code the narrative descriptions of suicide prevention interventions. This coding scheme consisted of nine intervention functions of the BCW: *Education, Persuasion, Incentivization, Coercion, Training, Restriction, Environmental restructuring, Modelling and Enablement*. The coding scheme included definitions and examples of each intervention function. As some interventions have multiple behaviour change activities, more than one intervention function was recorded for each intervention.

As a primary reviewer, I coded intervention descriptions according to the nine intervention functions of the BCW (Question 1). I coded the first five studies using the coding scheme and coded data were verified by a behaviour change expert (thesis supervisor) to identify any discrepancies and ensure consistency. After verifying the coding strategy, I received necessary coaching. Then, I extracted the remaining data, and a thesis supervisor verified 30% of coded data. A thesis supervisor confirmed that no more verification was necessary.

I received necessary training prior to data analysis and ongoing coaching on the application of the BCW. I have taken the Introduction to Behaviour Change: Principles & Practice course in July 2020 offered by the Online Summer School of the University College London (UCL). UCL is an internationally recognized institute, and the course

was taught by the founders and recognized experts of the BCW. After completing this course, I gained a greater understanding of the application of behaviour change theories to characterize interventions, and I believe this added strength and rigour to my coding strategy. Also, my supervisors, who have expertise in the application of behaviour change theories, provided appropriate guidance and coaching when it was necessary.

3.8.2 Categorizing Outcome Measures

I developed a coding scheme (Appendix 5) directly from a recent work by Reilly et al. (2020), which integrated Implementation Outcomes Framework (IOF) (Proctor et al., 2011) and Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) framework (Glasgow et al., 1999). Using this coding scheme, I categorized different levels of outcome measures reported in the included studies. Both IOF and RE-AIM are models to guide planning, implementing and evaluating interventions. Additionally, IOF (Baumann et al., 2015; Escoffery et al., 2018) and RE-AIM (Allen et al., 2011; Schlechter et al., 2016) have been used in systematic reviews of health care research to organize outcomes data. The IOF consists of eight implementation outcomes including acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration, and sustainability (Proctor et al., 2011), and Reilley and colleagues (2020, p.4) state that some of these IOF constructs – costs, fidelity, and sustainability – overlap with RE-AIM dimensions, and some others – acceptability, feasibility, and appropriateness – "reflect theoretical antecedents of implementation outcomes." Reilly et al. (2020) integrated eight constructs of IOF across the RE-AIM by expanding the operational dimensions of the RE-AIM and captured precursors of implementation outcomes in the RE-AIM (Reilly et al., 2020).

Outcomes within the effectiveness measures were further dissected to levels of clinicians, patients, and organizations to distinguish the interventions' level of impact. Definitions for each outcome levels are detailed in the coding scheme (Appendix 5). This review excluded articles that exclusively looked at patient outcomes. However, if included studies reported patient outcomes along with other outcome levels, they were documented according to the coding scheme.

As a primary reviewer, I categorized outcome measures according to the expanded RE-AIM framework presented by Reilly et al., (2020) (Question 2). I coded the first five studies using the coding scheme and they were verified by a thesis supervisor to identify any discrepancies and inconsistencies. After verifying my coding strategy, I coded the remaining outcomes data. Thirty percent of coded data were verified by a thesis supervisor and confirmed that no more verification was necessary. Instead of generating new categories of outcome measures when analyzing data, this review contributes to the growing body of evidence using pre-existing theoretical frameworks.

3.9 Summary and Presentation of Findings

In the next chapter, the extracted data are presented in a tabular form augmented with narrative report in a manner that aligns with the objective of this scoping review. The tabular summary highlights the major categories of the data extraction tool as described in **3.7**. A narrative description of suicide prevention interventions, which are classified according to the nine intervention function types of the BCW (Question 1), are provided to discuss apparent strengths and gaps in current interventions in relation to the known barriers to suicide prevention in the EDs. Moreover, a mapping of interventions using the BCW promotes a contextualized understanding of how interventions influence

clinicians' behaviour change. Lastly, I report a narrative description of each interventions' outcome measures accompanied by the tabulated results (Question 2) and describe how they relate to the intervention functions and behaviour change. I describe the key characteristics of current interventions and provide explanations as to why and how interventions may work.

3.10 Summary of Changes from the Original Proposed Protocol

I decided to extract an additional item, "the type of ED," and there were no other major changes in the extraction tool. I initially planned to have two independent reviewers appraise methodological qualities of the papers. However, it was not feasible, and instead, all critical scores were verified by a second reviewer after being appraised by the primary reviewer. Scoping reviews do not require critical appraisal, and appraised scores did not serve as an exclusion criterion; therefore, this change in the review did not affect scientific rigour in knowledge synthesis. I initially planned to have two independent reviewers code all data. Data coding required application of the BCW and RE-AIM framework, which required special training and ongoing coaching. However, it was not feasible to train all secondary reviewers to independently code the data and meet the thesis timeline. As a result, I coded all data then an expert (thesis supervisor) verified 30% of coded data. After data verification, the thesis supervisor confirmed that no more verification was necessary.

The work in Chapter 3 was accepted for publication in: H. D. Shin, C. Cassidy, L. Weeks, L. A. Campbell, M. A. Rothfus, J. A. Curran. (2020). Interventions to change clinician behaviour in relation to suicide prevention care in the emergency department: A scoping review protocol. *JBI Evidence Synthesis*

HDS conceived the study with input from JC, CC, LW, MAR and LAC. HDS drafted the manuscript, and all authors read and approved the final manuscript

CHAPTER FOUR: RESULTS

This review report adheres to the PRISMA Extension for Scoping Reviews reporting guideline (Tricco et al., 2018).

4.1 Selection of Sources of Evidence

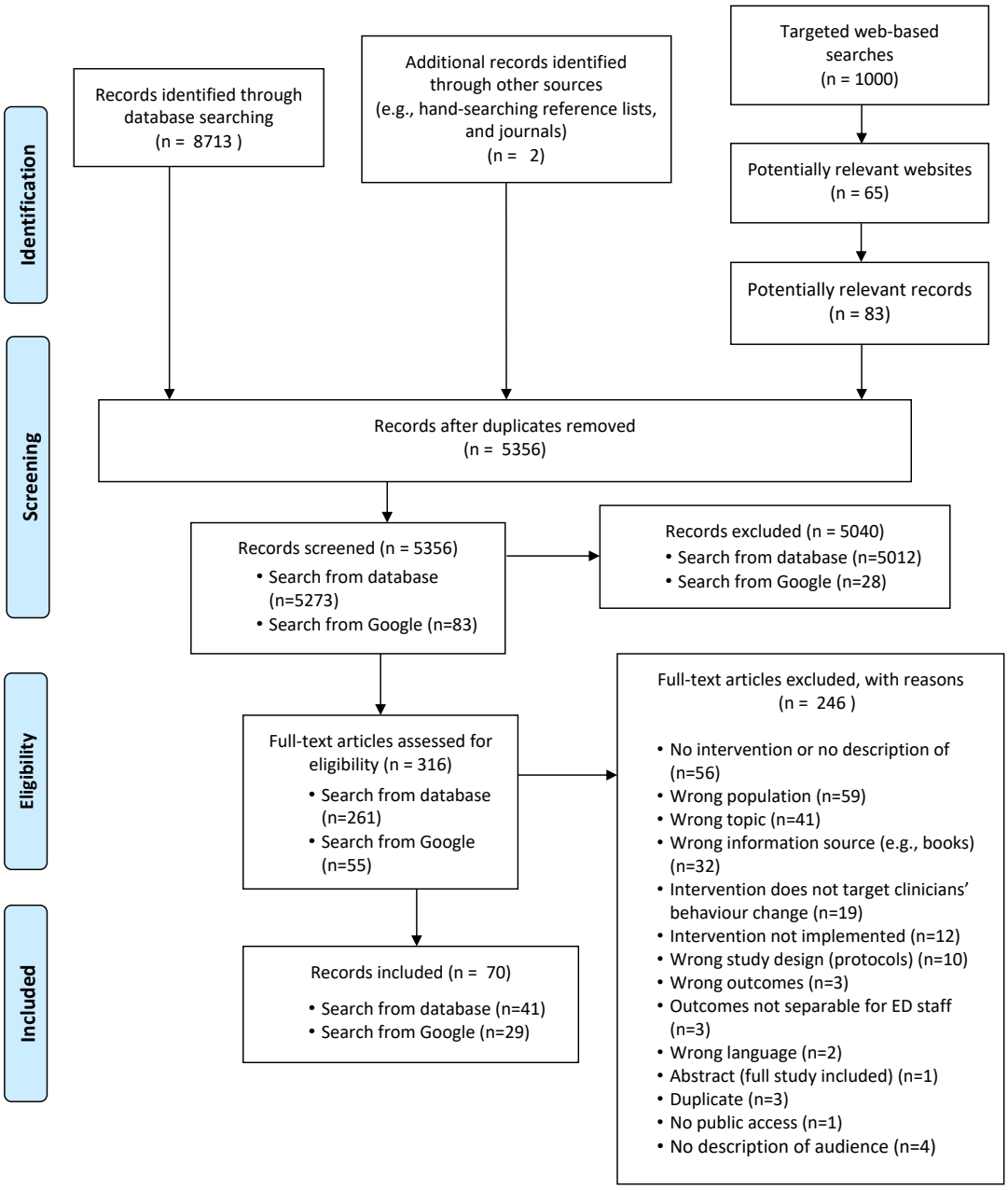
4.1.1 Results from the Database Search

We identified 8,713 citations from PubMed, PsychInfo, CINAHL, Embase, ProQuest Dissertations & Theses Global, Scopus for conference papers. After the duplicate removal, 5,273 citations remained for assessment against inclusion criteria. An additional two original studies that met the inclusion criteria were identified though hand-searching reference lists of relevant reviews identified from the search. No new citations were identified from hand-searching three key journals (*Journal of Mental Health, Journal of Emergency Medicine, Journal of Emergency Nursing*). After screening titles and abstracts, 261 citations remained for full-text review. Then after full-text review, 42 citations were included. One citation was a duplicate, leaving a total of 41 citations. Of 41 citations, 37 were peer-reviewed articles, three were dissertations, and one was an abstract. See Figure 4-1 for the PRISMA flow chart. The list of excluded full-text articles and the reasons for exclusion can be found in Appendix 6.

4.1.2 Results from the Targeted Google Search

There was a total of 1,000 records identified from the targeted Google search. We identified 65 relevant websites and screened 83 relevant records for title, heading, abstract, or table of contents. Fifty-five records were eligible for full-text review against the inclusion criteria, of which 29 citations were included in data analysis. Of the 29 included citations, one was a pilot study report and the rest of them were interventions

themselves. See Figure 4-1 for the PRISMA flow chart. The search results can be found in Appendix 2 and 3. The list of excluded full-text citations and the reasons for exclusion can be found in Appendix 7.



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Figure 4-1. PRISMA Flow Chart

4.2 Characteristics of Included Studies

4.2.1 Study and Intervention Types

In addition to 41 studies identified from the database search, the targeted Google search identified one mixed methods pilot study report (Lamb et al., 2006). This brought the total of 42 studies. The studies were a mix of quasi-experimental (n=24) (Ahn et al., 2020; Appleby et al., 2000; Betz et al., 2015; Boudreaux et al., 2016; Boudreaux. et al., 2020; Crawford, Turnbull, & Wessely, 1998; Currier et al., 2012; Fendrich. et al., 1998; Giordano R. & Stichler, 2009; Hackfeld, 2020; Horwitz et al., 2011; Kawashima et al., 2020; Kishi et al., 2014; Krishnaiah, 2019; Lebo, 1995; Lygnugaryte-Griksiene & Leskauskas, 2018; McAllister, Zimmer-Gembeck, Moyle, & Billett , 2008; Morgan & Coleman, 2000; O'Neill, Horowitz, Smith, Levin & Klavon S., 2001; Reshetukha et al., 2018; Runyan et al., 2016; Stone & Szmukler, 2002; Suokas, Suominen, & Lönnqvist, 2009; Turnbull & Chalder, 1997), experimental (n=2) (Clarke et al., 2002; van Landschoot et al., 2017), non-experimental (n=12) (Ballard et al., 2017; Beaver, 2016; Brovelli et al., 2017; Canady, 2018; Cracknell, 2015; Dennis. et al., 2001; DeVylder et al., 2020; Dimeff et al., 2020; Huline-Dickens & Adiele, 2007; Mueller et al., 2020; Vaughan, 2019; Wiesel Cullen et al., 2020), mixed-methods (n=3) (Lamb et al., 2006; McAllister, Billett, et al., 2009; McAllister, Moyle, et al., 2009) and qualitative (n=1) (Chesin et al., 2017) in design. Interventions included in the 42 studies were a mix of workshops, guidelines, seminars, on-line modules, new care teams, and power point presentations. See Table 4-1 for more detail.

Table 4-1. Characteristics of Included Studies

Authors, Year	Study Design	Country of Origin	Geographical Setting	ED Type	Clinicians Involved	Intervention Type
Ahn et al., 2020	Quasi-experimental Study	South Korea	Urban	General	Social workers	New care team
Applyby et al., 2000	Quasi-experimental Study	UK	Urban	General	Nurses, Junior medical staff	Written handouts, oral presentations, discussion, videotaped presentations and role play with feedback
Ballard et al., 2017	Cohort	USA	Urban	Pediatrics	Nurses	Training, feedback, integration of screening into electronic medical record system
Beaver 2016	Cross sectional	USA	Rural	General	Nurses	Training, tools for recognizing high risk suicide ideation
Betz et al., 2015	Quasi-experimental	USA	Not reported	Not specified	Nurses, physicians	Training
Boudreaux et al., 2020	Quasi-experimental	USA	Not reported	General	ED staffs, not specified	Workshop, integration of electronic medical record system, a new team, feedback
Boudreaux et al., 2016	Quasi-experimental	USA	Not reported	General	Nurses	Training, feedback, new support team
Brovelli et al., 2017	Cross sectional	Switzerland	Not reported	General	Case managers	Case manager
Canady 2018	Cross sectional	USA	Urban	General	Nurses, physicians, Social workers	Education module, integration of screening into electronic medical record system
Chesin et al., 2017	Qualitative	USA	Not reported	General	ED mental health or medical staff, not specified	New support team for service coordination

Authors, Year	Study Design	Country of Origin	Geographical Setting	ED Type	Clinicians Involved	Intervention Type
Clarke et al., 2002	Randomised controlled trial	UK	Not reported	General	Nurse practitioner, Mental health nurses, Nurse practitioner case managers	Case managers
Cracknell 2015	Quality improvement report	UK	Not reported	General	Nurses, Physicians	Teaching session, poster, prompts
Crawford et al., 1998	Quasi-experimental	UK	Urban	General	Nurses, trainees, Mental health consultants	Teaching session
Currier et al., 2012	Quasi-experimental	USA	Not reported	General	Physicians, Trainees, Physician assistants, Nurse practitioners and Nurses	Poster, Guideline, Resource
Dennis et al., 2001	Cohort	UK	Not reported	General	ED staffs, Physicians, Psychiatric clinical nurse specialists, Consultant liaison psychiatrists, Senior house officers	Training seminar, extension of specialist team hours
DeVylder et al., 2020	Cohort	USA	Urban	Pediatrics	Nurses	Training
Dimeff et al., 2020	Formative evaluation study (descriptive and qualitative)	USA	Not reported	General	Hospital administrators, Medical providers, psychiatric liaisons, ED staff, Other	Virtual avatar
Fendrich et al., 1998	Quasi-experimental	USA	Not reported	Not specified	Nurses, Physicians	Mail education campaign, guidelines
Giordano and Stichler 2009	Quasi-experimental	USA	Urban	General	Nurses	Education module

Authors, Year	Study Design	Country of Origin	Geographical Setting	ED Type	Clinicians Involved	Intervention Type
Hackfeld 2020	Quasi-experimental	USA	Urban	Pediatrics	Nurses	Power Point education, script for SRTB assessment, video demonstration, integration of screening into electronic medical record system
Horwitz et al., 2011	Quasi-experimental	USA	Not reported	Pediatrics	Medica trainee	Educational program
Huline-Deckens et al., 2007	Quality improvement/program description paper	UK	Not reported	Pediatrics	Senior House Officers (physicians, psychiatrists)	Teaching session
Kawashima et al., 2020	Quasi-experimental	Japan	Not reported	Not specified	Nurses, Physicians Social workers, Clinical psychologists, Other ED staffs	Lectures, group workshops
Kishi et al., 2014	Quasi-experimental	Japan	Not reported	General	Nurses, Physicians, Social workers	Education
Krishnaiah 2019	Quasi-experimental	Australia	Not reported	Not specified	ED clinicians, not specified	Training
Lamb et al., 2006	Mixed-methods	Ireland	Mixture of rural and urban	General	Nurses	Tutorial, workshop, discussion
Lebo 1995	Quasi-experimental	USA	NR	General	ED clinicians, not specified	Teaching session, guideline for checklist
Lygnugaryte-Griksiene et al., 2018	Quasi-experimental	Lithuania	NR	Not specified	Nurses, Physicians	Training, role playing workshops
McAllister et al., 2008	Quasi-experimental	Australia	Urban	General	Nurse	Power Point presentation

Authors, Year	Study Design	Country of Origin	Geographical Setting	ED Type	Clinicians Involved	Intervention Type
McAllister, Billett et al., 2009	Mixed-methods	Australia	Urban	General	Nurse	Power Point presentation
McAllister, Moyle al., 2009	Mixed-methods (but only reported qualitative data)	Australia	Urban	General	Nurse	Power Point presentation, video, discussion
Morgan and Coleman 2000	Quasi-experimental	UK	Semi-rural	General	Nurses, Other	Creation of new team
Mueller et al., 2020	Qualitative descriptive	USA	Urban	General	Ten non-physician intervention counselors	Training course, script for CALM-ED
O'Neill et al., 2001	Quasi-experimental	USA	Not reported	Pediatrics	Nurses	In-services education
Reshetukha et al., 2018	Quasi-experimental	Canada	Not reported	General	Physicians	Educational session, poster
Runyan et al., 2016	Quasi-experimental	USA	Not reported	Pediatrics	Behavioural health clinicians, Physicians	On-line training, brochures
Stone and Szmukler 2002	Quasi-experimental	UK	Urban	General	Medical trainees	Seminars, email communication
Suokas et al., 2009	Quasi-experimental	Finland	Urban	General	Physicians and Nurses	New care team
Turnbull and Chalder 1997	Quasi-experimental	UK	Not reported	General	Nurses, Physicians	Teaching session
van Landschoot et al., 2017	Randomised controlled trial	Belgium	Not reported	General	Physicians, Psychiatrists, psychologists, Nurses, Social workers, Paramedics, Other *Participants unable to be separated between ED vs psychiatric department	Poster, Guideline, Resource

Authors, Year	Study Design	Country of Origin	Geographical Setting	ED Type	Clinicians Involved	Intervention Type
Vaughan 2019	Non-experimental, correlational-descriptive	USA	Not reported	Not specified	Nurses	In-service education, Power Point presentation, handouts
Wiesel et al., 2020	Cross sectional	USA	Not reported	Mixture of Pediatrics and General	Nursing directors or managers, social workers, Nurses, Behavioural health directors, Medical directors	Extension of specialist team hours

4.2.2 Geographical Locations

Studies originated from the North America (USA (n=20), Canada (n=1)), Europe (UK (n=9), Belgium (n=1), Finland (n=1), Switzerland (n=1), Lithuania (n=1), Ireland(n=1)), Oceania (Australia (n=4)), and Asia (Japan (n=2), South Korea (n=1)).

4.2.3 ED locations and ED Types

Across the 42 included studies, there was an overall lack of reporting on geographical settings and ED types. Table 4-2 summarizes geographical settings of the EDs and ED types. Only two of the 14 studies that reported geographic setting were from non-urban areas. Only seven of the 34 studies that reported ED type were pediatric EDs.

Table 4-2. Geographical Settings and ED Types

Geographical setting	Number of studies (n)
Urban	n=12*
Semi-rural	n=1
Rural	n=1
Not reported	n=26
sED type	**Number of studies (n)**
Pediatrics	n=7
Mixed (Pediatrics + General)	n=1
General	n=26*
Not reported	n=6
More than one ED	n=11
* represents unique number of studies; three papers were the same study, but reported on different outcome measures (McAllister, Billett, et al., 2009; McAllister et al., 2008; McAllister, Moyle, et al., 2009)	

4.2.4 Participant Characteristics

Twenty-seven unique studies targeted nurses' behaviour change related to suicide prevention and 16 unique studies targeted ED physicians' behaviour change. Studies also targeted a few other types of allied health care providers, such as social workers, nurse practitioners and psychiatrists. See Tables 4-3 and 4-4 for more detail.

Table 4-3. Participant Types

	Nurse	ED Physician	Social workers	Trainee	Psychiatrist	Nurse practitioner	Psychologist	Other	Not specified
Number of studies	27*	16	5	4	3	2	2	11	5
Other types include case manager, consultant, medical director, etc. * Three studies have the same nurse participants but reported on different outcomes measures (McAllister, Billett, et al., 2009; McAllister et al., 2008; McAllister, Moyle, et al., 2009) Other (e.g., case manager, consultant, medical director)									

Table 4-4. Number of Disciplines Represented in Each Study

Number disciplines included	Number of unique studies	Discipline(s) (n= number of unique studies)
1	21	Nurse: n=11 ED physician: n=1 Social worker: n=1 Trainee: n=2 Other: n=2 Not specified: n=4
2	11	Nurse + ED physician n=7 Nurse + other: n= 1 ED physician + Psychiatrist: n=1 ED physician + other: n=1 Other +not specified: n=1
3	4	Nurse + ED physician + Social worker: n=2 Nurse + ED physician + Other: n=1 Nurse + Trainee + Other: n=1
4	1	Nurse + ED physician + Psychiatrist + other: n=1
5	2	Nurse + ED physician + Social worker + Psychologist + Other: n=1 Nurse + ED physician + Nurse Practitioner + Trainee + Other: n=1
6	1	Nurse + ED physician + Social worker + Psychologist + Psychiatrist + Other: n=1
Other (case manager, director, consultant)		

4.2.5 Methodological Quality

We assessed methodological quality of 35 included studies using JBI Critical Appraisal checklists, Mixed Method Appraisal Tool (MMAT) and Quality Improvement Minimum Quality Criteria Set. Seven studies were not eligible for a critical appraisal for several reasons: 1) grey literature (e.g., thesis, report), 2) abstract, 3) in-progress study. Twenty-one quasi-experimental studies had critical appraisal scores ranging from 33% to

89%. Sources of bias were related to lack of transparency in the characteristics of comparison groups and weaknesses in outcome measurements. Only two studies clearly stated that there were no significant variations between the groups. Other sources of bias were related to absences of multiple and reliable measurements. Studies often lost points for using self-report for outcome measurements. Two studies were randomized control trials, with critical appraisal scores ranging from 62% to 69%. Sources of bias were related to blinding participants, intervention deliverers, and outcome assessors. Three cohort studies' appraisal scores ranged from 25% to 78%. The main risk of bias was related to exposure measurement, and none of the studies stated if participants were free of the outcome at the start of the study. Three cross-sectional studies' scores ranged from 43%-50%. For this type of study, the sources of bias were related to the absence of valid and reliable exposure measurements and the absence of appropriate accounting for confounders. There was one qualitative study and received a score of 44%. This study did not state philosophical perspective, which subsequently affected the assessment of congruency between methodology and data interpretation. Other sources of bias were related to presentation of direct quotes, acknowledgement of the author's cultural and theoretical stance and authors' potential influence on the research. Three studies were assessed using the MMAT (Hong, 2020), and all received a score of 60%. Of the three studies, two were mixed methods in design which lacked clarification of non-response bias. The remaining was a quantitative descriptive study, and the main sources of bias were related to sampling strategy and justification for descriptive statistics. Lastly, two quality improvement reports scored 38% and 56%. Sources of bias were related to lack of

transparency in the characteristics of organizations and processes of implementation and a lack of health-related patient outcomes.

Overall, mean score of methodological assessment was 61.5% (Standard Deviation 14.1%), and 17 studies received a score of 60% or below (Appleby et al., 2000; Betz et al., 2015; Brovelli et al., 2017; Canady, 2018; Chesin et al., 2017; Cracknell B, 2015; Dennis M. et al., 2001; DeVylder et al., 2020; Dimeff et al., 2020; Giordano R & Stichler JF, 2009; Huline-Dickens & Adiele, 2007; McAllister, Billett, et al., 2009; Mueller et al., 2020; O'Neill K.A. et al., 2001; Suokas et al., 2009; Turnbull G. & Chalder T., 1997; Wiesel Cullen et al., 2020). Tables 8-1 through 8-8 in Appendix 8 present a summary of more detailed information on methodological quality across study designs.

4.3 Characteristics of Included Citations from Targeted Google Search

The targeted Google searches yielded 19 organizations/websites which described one or more intervention targeting ED clinicians' behaviour change related to suicide prevention. Nineteen organizations are listed in Appendix 9. Data analysis included a total of 29 interventions identified from the Google search. One was a pilot study report, and the rest were interventions themselves that are publicly available and designed for ED clinicians' behaviour change related to suicide prevention. All included citations from the Google search explicitly stated that the interventions were made for ED staff but did not specify the target disciplines. The characteristic of one mixed methods study identified from the Google search (Lamb et al., 2006) was reported along with other studies identified from the database search in section **4.2**. In this section **4.3**, I describe general characteristics of the 28 interventions identified through the Google search.

4.3.1 Intervention Types

This review found diverse types of interventions online. As shown in Table 4-5, 28 interventions were a mix of guidelines (n=14), resources (n=4), video/webinar (n=3), blog post (n=2), care pathway (n=2), toolkit (n=1), poster (n=1), online training course (n=1), mobile application (n=1) and an audit tool (n=1). One citation had a guide, poster and resource all together (SPRC, 2008). They were all freely accessible through the website, including the online training course and mobile app. The websites did not provide any evaluation data on these interventions but descriptions of interventions.

Table 4-5. Types of Interventions Identified from Targeted Google Search

Title	Country	Author, Year	Type
How Emergency Departments Can Help Prevent Suicide among At-Risk Patients: Five Brief Interventions	USA	Suicide Prevention Resource Center (SPRC), 2018	Video
Caring for Adult Patients with Suicide Risk: A Consensus Guide for Emergency Departments	USA	SPRC, 2015	Guideline
Advancing Suicide Prevention Practice in the Emergency Department Setting	USA	SPRC, 2011	Webinar
"Is Your Patient Suicidal?" Emergency Department Poster and Clinical Guide - Suicide Risk: A Guide for ED Evaluation and Triage-guide - Is Your Patient Suicidal?- Poster - Using the "Is Your Patient Suicidal?" Poster and Triage Guide	USA	SPRC, 2008	Poster + Guideline + Resource
The Patient Safety Screener: A Brief Tool to Detect Suicide Risk	USA	SPRC, n.d.	Video
Continuity of Care for Suicide Prevention: The Role of Emergency Departments	USA	SPRC, 2013	Resource document
Preventing Suicide Guidance in Emergency Departments	New Zealand	Ministry of Health, New Zealand, 2016	Guideline
SAFE-T Pocket Card: Suicide Assessment Five-Step Evaluation and Triage for Clinicians	USA	Substance Abuse and Mental Health Services Administration (SAMHSA), 2009	Guide pocket card

Title	Country	Author, Year	Type
After an Attempt :A Guide for Medical Providers in the Emergency Department Taking Care of Suicide Attempt Survivors	USA	SAMHSA, 2018 Original version published in 2006 was updated in 2018	Brochure
Ask Suicide-Screening Questions (ASQ) Toolkit	USA	National Institute of Mental Health, 2020 Original version published in 2012 was updated in 2020	Toolkit
Seattle Children's Hospital Zero Suicide Initiative Pathways	USA	Seattle Children's Hospital, 2019	Clinical pathway
Guidelines for integrated suicide-related crisis and follow-up care in emergency departments and other acute settings	Australia	Hill et al., 2017	Guideline
iCar2e: A Tool for Managing Suicidal Patients in The ED	USA	American College of Emergency Physicians, 2020 Original version published in 2018 was updated in 2020	Mobile app
Suicide Prevention Awareness	USA	American College of Emergency Physicians, n.d.	Inventory of resources
Emergency Room Staff	USA	S.A.F.E. Alternatives Self Abuse Finally Ends, n.d.	Blog post of tips for having conversations with patients who self-harm
Managing self-harm in emergency departments	UK	National Institute for Health and Care Excellence, 2020	Care pathway
Emergency Department Tips & Tricks for Managing the Suicidal Patient	USA	Simon, 2016	Blog post by emergency medicine physicians
Clinical Practice Guideline: Suicide Risk Assessment Full Version 2012	USA	Emergency Nurses Association (ENA), 2012	Clinical practice guideline
Clinical Practice Guideline: Suicide Risk Assessment 2017	USA	(ENA, 2017) (updated version of above)	Clinical practice guideline
Training: Suicide Prevention in the Emergency Department	USA	Tennessee Suicide Prevention Network (TSPN), n.d.	Online training course
Suicide - Working with the suicidal person: Clinical practice guidelines for emergency departments and mental health services	Australia	Department of Health and Human Services, 2010a	Clinical guideline
Quick reference guide_Suicide - Working with the suicidal person: Clinical practice guidelines for emergency departments and mental health services	Australia	Department of Health and Human Services, 2010b	Clinical guideline: Quick reference guide

Title	Country	Author, Year	Type
Suicide Prevention, Substance Abuse, & Psychiatric Emergencies	USA	Ohio American College of Emergency Physicians, n.d.	Inventory of resources
CALL TO ACTION Suicide Prevention and Intervention in the Emergency Department (ED)	USA	MN Health Collaborative, 2019	Recommendation and guideline
Practice guidelines for the management of suicide attempts and suicidal ideation presenting in Emergency Department	Nepal	Sharma et al., 2019	Practice guidelines
Emergency department self-harm presentations: Clinical Audit Tool	New Zealand	New Zealand Guidelines Group, 2011	Audit tool
Suicide Risk Assessment and Management Emergency Department	Australia	The New South Wales Ministry of Health, 2004	Clinical guideline
Management of Self Harm Presentations to Emergency Department Clinical Programme: Standard Operating Procedure	Ireland	National Clinical Programme Office, Health Service Executive, 2014	Standard operating procedure

4.3.2 Geographical Locations

A total of 28 interventions originated from the North America (USA (n=19)), Europe (New Zealand (n=2), Ireland (n=1), and UK (n=1)), South Asia (Nepal (n=1)), and Oceania (Australia (n=4)).

4.4 Characteristics of Interventions and Intervention Functions (Review Question 1)

Of the total of 70 citations, there were 66 unique interventions. One intervention from the targeted Google search (SPRC, 2008) was used in two of the included studies (Currier et al., 2012; van Landschoot et al., 2017). Also, there were three separate publications (McAllister, Billett, et al., 2009; McAllister et al., 2008; McAllister, Moyle, et al., 2009) for one study where authors reported different outcome measures in each paper. This brought the total to 66 unique interventions which were categorized and characterized using the pre-developed coding scheme (Appendix 5).

4.4.1 Intervention Category

Included interventions were categorized consistently with section **2.1**: 1) Screening and Assessment, 2) Brief Interventions, 3) Disposition and Discharge Planning, 4) Empathetic Care and Therapeutic Relationship, 5) Clinical management. The clinical management category was added to capture more general management practices, including documentation practice and safety measures for EDs in the presence of patients with SRTB. Sixty-six identified interventions targeted behaviour change related to one or more categories of suicide prevention interventions. Fifty (75.7%) interventions targeted ED clinicians' behaviour change related to suicide risk screening and assessment. Twenty-four (36.4%) interventions targeted clinicians' behaviour change related to ED-based brief interventions (e.g., safety planning, lethal means counselling). There were 29 (43.9%) interventions related to disposition and discharge planning, and 33 (50%) interventions were related to more general clinical management. Only six (9.1%) interventions targeted clinicians' behaviour related to empathetic care and the therapeutic relationship. Table 4-6 presents a summary of categorized interventions.

Table 4-6. Suicide Prevention Intervention Category

Author, Year	Suicide Prevention Intervention Category				
	Screening and Assessment	Emergency Department-based Brief Interventions (e.g., safety planning, lethal means counselling)	Disposition Decision and Discharge Planning (e.g., follow-up, referrals)	Empathetic Care and Therapeutic Relationship	Clinical Management (e.g., risk management in ED, documentation, general management)
Total number of citations	52	26	31	8	37
Unique count n (%)	**50 (75.7%)**	**24 (36.4%)**	**29 (43.9%)**	**6 (9.1%)**	**33 (50%)**
Ahn. et al., 2020			✓		
Appleby et al., 2000	✓				✓
Ballard et al., 2017	✓				
Beaver, 2016	✓	✓			✓
Betz et al., 2015	✓	✓			

Author, Year	Suicide Prevention Intervention Category				
	Screening and Assessment	Emergency Department-based Brief Interventions (e.g., safety planning, lethal means counselling)	Disposition Decision and Discharge Planning (e.g., follow-up, referrals)	Empathetic Care and Therapeutic Relationship	Clinical Management (e.g., risk management in ED, documentation, general management)
Boudreaux et al., 2020	✓	✓			
Boudreaux et al., 2016	✓				
Brovelli et al., 2017	✓	✓	✓		
Canady, 2018	✓				
Chesin et al., 2017		✓	✓		
Clarke et al., 2002	✓	✓	✓		
Cracknell, 2015	✓				✓
Crawford et al., 1998	✓		✓		
Currier et al., 2012 *	✓	✓	✓		✓
Dennis M. et al., 2001	✓				
DeVylder et al., 2020	✓				
Dimeff et al., 2020	✓	✓	✓		
Fendrich et al., 1998		✓			
Giordano R & Stichler JF, 2009	✓	✓	✓		
Hackfeld, 2020	✓				✓
Horwitz et al., 2011)	✓				✓
Huline-Dickens & Adiele, 2007					✓
Kawashima et al., 2020	✓				✓
Kishi et al., 2014	✓		✓		✓
Krishnaiah R., 2019	✓	✓	✓		
Lebo, 1995	✓				
Lygnugaryte-Griksiene & Leskauskas, 2018	✓				✓
McAllister et al., 2008 **				✓	✓
McAllister, Billett, et al., 2009 **				✓	✓
McAllister, Moyle, et al., 2009 **				✓	✓
Morgan & Coleman, 2000	✓		✓		
Mueller et al., 2020		✓			
O'Neill et al., 2001	✓				✓
Reshetukha et al., 2018	✓				✓
Runyan et al., 2016		✓	✓		
Stone & Szmukler, 2002	✓				✓
Suokas et al., 2009	✓		✓		
Turnbull & Chalder, 1997			✓		
van Landschoot et al., 2017*	✓	✓	✓		✓

Author, Year	Suicide Prevention Intervention Category				
	Screening and Assessment	Emergency Department-based Brief Interventions (e.g., safety planning, lethal means counselling)	Disposition Decision and Discharge Planning (e.g., follow-up, referrals)	Empathetic Care and Therapeutic Relationship	Clinical Management (e.g., risk management in ED, documentation, general management)
Vaughan, 2019	✓				
Wiesel Cullen et al., 2020	✓	✓	✓		
Lamb et al., 2006	✓		✓		
SPRC, 2018		✓	✓		
SPRC, 2015	✓	✓	✓		✓
SPRC, 2011	✓	✓	✓		
SPRC, 2008	✓	✓	✓		✓
SPRC, n.d.	✓			✓	✓
SPRC, 2013	✓	✓	✓		
Ministry of Health, New Zealand, 2016	✓	✓			✓
SAMHSA, 2009	✓				✓
SAMHSA, 2006, 2018	✓		✓		✓
National Institute of Mental Health 2012, 2020	✓				
Seattle Children's Hospital, 2019					✓
Hill et al., 2017	✓	✓	✓		
American College of Emergency Physicians, 2020 Original version published in 2018 was updated in 2020	✓	✓	✓	✓	
(American College of Emergency Physicians, n.d.)					✓
S.A.F.E. Alternatives Self Abuse Finally Ends, n.d.					✓
National Institute for Health and Care Excellence, 2020					✓
Simon, 2016					✓
ENA, 2012	✓				✓
ENA, 2017 (updated version of above)	✓				✓
TSPN, n.d.	✓	✓	✓	✓	✓
Department of Health and Human Services, 2010a	✓		✓	✓	
Department of Health and Human Services, 2010b	✓			✓	✓

Author, Year	Suicide Prevention Intervention Category				
	Screening and Assessment	Emergency Department-based Brief Interventions (e.g., safety planning, lethal means counselling)	Disposition Decision and Discharge Planning (e.g., follow-up, referrals)	Empathetic Care and Therapeutic Relationship	Clinical Management (e.g., risk management in ED, documentation, general management)
Ohio American College of Emergency Physicians, n.d.					✓
MN Health Collaborative, 2019	✓	✓	✓		✓
Sharma et al., 2019	✓		✓		✓
New Zealand Guidelines Group, 2011	✓		✓		
The New South Wales Ministry of Health, 2004	✓		✓		✓
National Clinical Programme Office, Health Service Executive, 2014					✓
*Intervention by Suicide Prevention Resource Center (2008) was used by Currier et al. (2012) and van Landschoot et al. (2017) **Three citations are the same study but reported on different outcomes measures (McAllister, Billett, et al., 2009; McAllister et al., 2008; McAllister, Moyle, et al., 2009).					

4.4.2 Mapping Interventions on the Behaviour Change Wheel

As some interventions contained multiple behaviour change activities, more than one BCW intervention function was recorded for each intervention. The frequency of intervention functions was recorded: *Education* (n=48), *Persuasion* (n=21), *Incentivization* (n=2), *Coercion* (n=0), *Training* (n=40), *Restriction* (n=0), *Environmental restructuring* (n=18), *Modeling* (n=7), *Enablement* (n=36). As shown in Table 4-7, 66 interventions comprised a variety of different combinations of BCW intervention functions. Most notably, *Education* was the most common, and *Training* was the next common type. Table 4-8 presents representative quotes for each intervention function. The coding scheme and definitions that guided intervention mapping can be found in Appendix 5.

Table 4-7. Summary of Recorded Intervention Functions

Author, Year	Nine Intervention Functions								
	Education	*Persuasion*	*Incentivization*	*Coercion*	*Training*	*Restriction*	*Environmental restructuring*	*Modelling*	*Enablement*
Total number of citations	52	23	2	0	44	0	20	7	38
Unique count n (%)	**48** (72.7%)	**21** (31.8%)	**2** (3.03%)	**0** (0%)	**40** (60.6%)	**0** (0%)	**18** (27.3%)	**7** (10.6%)	**36** (54.5%)
Ahn et al., 2020							✓		✓
Appleby et al., 200	✓	✓			✓			✓	
Ballard et a., 2017		✓			✓		✓		
Beaver 2016	✓				✓				✓
Betz et al., 2015	✓								
Boudreaux et al., 2020	✓	✓			✓		✓	✓	✓
Boudreaux et al., 2016	✓	✓	✓		✓		✓		✓
Brovelli et al., 2017									✓
Canady 2018	✓	✓					✓		
Chesin et al., 2017							✓		✓
Clarke et al., 2002							✓		
Cracknell 2015	✓				✓		✓		
Crawford et al., 1998	✓				✓				
Currier et al., 2012*	✓	✓			✓		✓		✓
Dennis et al., 2001	✓				✓		✓		✓
DeVylder et al., 2020					✓				
Dimeff et al., 2020							✓		✓
Fendrich et al., 1998	✓				✓				
Giordano and Stitchler 2009	✓				✓				
Hackfeld 2020	✓				✓		✓	✓	✓
Horwitz et al., 2011	✓				✓				

Author, Year	Nine Intervention Functions								
	Education	*Persuasion*	*Incentivization*	*Coercion*	*Training*	*Restriction*	*Environmental restructuring*	*Modelling*	*Enablement*
Huline-Deckens et al., 2007	✓								
Kawashima et al., 2020	✓				✓			✓	
Kishi et al., 2014	✓				✓				
Krishnaiah, 2019					✓				
Lebo, 1995	✓						✓		
Lygnugaryte-Griksiene et al., 2018	✓				✓			✓	
McAllister et al., 2008	✓				✓				
McAllister and Billett et al., 2009	✓				✓			✓	
McAllister and Moyle et al., 2009	✓				✓				
Morgan and Coleman 2000							✓		✓
Mueller et al., 2020					✓				✓
O'Neill et al., 2001	✓				✓				
Reshetukha et al., 2018	✓				✓		✓		
Runyan et al., 2016					✓				✓
Stone and Szmukler 2002	✓						✓		✓
Suokas et al., 2009							✓		✓
Turnbull and Chalder 1997	✓				✓				
van Landschoot et al., 2017*	✓	✓			✓		✓		✓
Vaughan 2019	✓				✓				
Wiesel Cullen et al., 2020							✓		✓
Lamb et al., 2006	✓				✓				✓
SPRC, 2018	✓				✓				✓
SPRC, 2015	✓	✓			✓				✓

Author, Year	Nine Intervention Functions								
	Education	*Persuasion*	*Incentivization*	*Coercion*	*Training*	*Restriction*	*Environmental restructuring*	*Modelling*	*Enablement*
SPRC, 2011	✓	✓							
SPRC, 2008	✓	✓			✓		✓		✓
SPRC, n.d.	✓	✓			✓				✓
SPRC, 2013	✓	✓							✓
Ministry of Health 2016	✓	✓			✓				✓
SAMHSA 2009					✓				✓
SAMHSA 2006, 2018	✓				✓				✓
National Institute of Mental Health 2012, 2020	✓	✓			✓				✓
Seattle Children's Hospital, 2019	✓	✓							✓
Hill et al., 2017	✓	✓			✓				
American College of Emergency Physicians, 2018, 2020	✓				✓				✓
American College of Emergency Physicians n.d.									✓
S.A.F.E. Alternatives Self Abuse Finally Ends, n.d.	✓				✓				
National Institute for Health and Care Excellence, 2020									✓
Simon 2016	✓								
ENA 2012	✓	✓							✓
ENA 2017 (updated version of above)	✓	✓							✓
(TSPN, n.d.)	✓	✓	✓		✓			✓	
(Department of Health and Human Services, 2010a)	✓	✓			✓				✓
(Department of Health and Human Services, 2010b)									✓
(Ohio American College of Emergency Physicians, n.d.)									✓
MN Health Collaborative (2019)	✓	✓							✓
(Sharma et al., 2019)	✓								

Author, Year	Nine Intervention Functions								
	Education	*Persuasion*	*Incentivization*	*Coercion*	*Training*	*Restriction*	*Environmental restructuring*	*Modelling*	*Enablement*
Ministry of Health (2011)	✓	✓			✓				
The New South Wales Ministry of Health, 2004	✓				✓				
National Clinical Programme Office, Health Service Executive, 2014	✓	✓							✓

*Intervention by Suicide Prevention Resource Center (2008) was used by Currier et al. (2012) and van Landschoot et al. (2017)
**Three citations are the same study but reported on different outcomes measures (McAllister, Billett, et al., 2009; McAllister et al., 2008; McAllister, Moyle, et al., 2009).

Table 4-8. Intervention Functions and Example quotes

Intervention functions	Example quotes
Education	"Utilized didactics, review of the manual…" (Boudreaux et al., 2020) "Covered basic information on the epidemiology of DSH, assessment of patients and the identification of those at risk, the difficulties that are sometimes associated with making assessments and how they can be manage..." (Crawford et al., 1998) "Educational in-services included a review of the [Clinical Practice Guideline] CPG, risk factors for suicide, and other psychiatric issues" (O'Neill et al., 2001)
Persuasion	"10% of all ED patients are thinking of suicide, but most don't tell you. Ask questions—save a life."(SPRC, 2008) "Consumers and family members also reported negative experiences involving a perception of unprofessional staff behavior, feeling the suicide attempt was not taken seriously, and long wait times." (SPRC, 2011) "Data reporting and feedback, and spot checks with frontline staff" (Boudreaux et al., 2020) "An additional presentation was made to the charge nurses in June 2013 to share initial compliance rates and problem-solve any administration concerns." (Ballard et al., 2017)
Incentivization	"Completion of the course provides the participant with one hour of continuing education towards certification by the National Association of Social Workers, the Tennessee Licensed Professional Counselors Association, the National Board for Certified Counselors, the American Academy of Family Physicians, or for Nursing Competence certification." (Department of Mental Health and Substance Abuse Services, n.d.) "Other small incentives (e.g., $5 gift cards and lunches) ..." (Boudreau et al., 2014)
Training	"A video presentation depicting the administration of ASQ and how to support a concerned parent" (Hackfield, 2020) "Trainees learned how to use an assessment and planning form for conducting

	assertive case management adequately, and how to respond to incidents during follow-up interventions." (Kawashima et al., 2020)
Environmental restructuring	"Around-the-clock mental health staffing in the ED" (i.e., having mental health staff in the ED 24/7) (Cullen et al., 2020) "It also involved constructing an electronic health record (EHR) screening protocol" (Canady, 2018) "The ASQ was added to the EMR in the pediatric ED for patients presenting with psychiatric concerns in March of 2013" (Ballard et al., 2017) "The poster and guide were displayed for four weeks in strategic staff-only sites such as meeting rooms, lunchrooms and staff toilets" (van Landschoot et al., 2017)
Modelling	Communication strategies such as the nurse trying to use the person's prior to making a request or asking a question, explaining the waiting time and checking on ongoing perceptions of safety, were demonstrated by the instructor (Mcallister, Billett et al., 2009) Role-playing workshops (Lygnugaryte-Griksiene et al., 2018)
Enablement	"Around-the-clock mental health staffing in the ED" (i.e., having mental health staff in the ED 24/7) (Cullen et al., 2020) The emergency clinic consultant was also available once a week to discuss problems encountered by the on-call doctors.(Stone and Szmukler, 2002) Ask Suicide - Screening Questions toolkit is available in 13 different languages (National Institute of Mental Health 2012, 2020)

There was wide variation across the included interventions, but many of them commonly used *Education* and/or *Training*. Most interventions included more than one BCW intervention functions, targeting different determinants of behaviour change simultaneously. There were 21 interventions composed of two different interventions functions, 21 interventions with three different intervention functions, and seven interventions composed of four different intervention functions. Five interventions had more than four interventions functions. Table 4-9 presents a summary of the number of intervention functions identified per intervention.

Table 4-9. Summary of the Number of Intervention Functions per Intervention

Number of intervention functions per intervention	Number of unique interventions	Combinations of intervention functions, n=number of interventions
1	12	Education: n=4 Enablement: n=5 Training: n=2 Environmental restructuring: n=1
2	21	Education + Training: n=10 Environmental restructuring + Enablement: n= 6 Training + Enablement: n=3 Education +Persuasion: n=1 Education +Environmental restructuring: n=1
3	21	Education + Persuasion + Enablement: n=6 Education + Training + Enablement: n=5 Education + Training + Modelling: n=3 Education +Persuasion +Training: n=2 Education +Training + Environmental restructuring: n=2 Education + Environmental restructuring+ Enablement: n=1 Education + Persuasion + Enablement: n=1 Persuasion + Training + Environmental restructuring: n=1
4	7	Education + Persuasion + Training + Enablement: n=5 Education + Training + Enablement + Environmental restructuring: n=1 Education + Training + Modelling + Persuasion n=1
5	3	Education+ Persuasion+ Incentivization + Training +Modelling: n=1 Education +Persuasion+ Training+ Environmental restructuring + Enablement: n=1 Education+ Training +Environmental restructuring + modelling +Enablement: n=1
6	2	Education + Persuasion + Training + Environmental restructuring +Modelling + Enablement: n=1 Education + Persuasion + Incentivization + Training + Environmental restructuring + Enablement: n=1

4.5 Reported Outcome Measures and Directions of Effect (Review Question 2)

As shown in Table 4-10, 42 studies reported outcomes of effectiveness at the level(s) of clinician (n=38), patient (n=4) or organization (n=6). Twenty-two studies reported measures of clinicians' conceptual knowledge use, such as changes in clinicians' confidence, self-efficacy, knowledge, and attitude. Twenty-four studies reported measures of clinicians' instrumental knowledge use, which included changes in observable behaviours noted in medical charts or self-report assessments. Two studies reported patient-reported experience, such as patient satisfaction and patient recall of treatment delivered. One study reported patient-reported outcome measure such as self-report of suicide risk level, and one other study reported patient outcome of mortality. Six studies reported outcome measures at the organizational level, such as changes in the admission rates and cost analysis. Although not all RE-AIM domains are necessary or

required in every study (Glasgow et al., 1999), a large proportion of the included studies focused on the domains of "effectiveness," and the rest received less attention. A few studies reported outcomes including measures of reach (n=5), adoption (n=5), and implementation (n=2). In terms of adoption, three studies looked at clinicians' acceptability as a degree of supporting implementation (Chesin et al., 2017; Dimeff et al., 2020; O'Neill et al., 2001) and two studies looked at satisfaction with intervention of interest (Horwitz et al., 2011; Kawashima et al., 2020). In terms of implementation, one study assessed feasibility as an antecedent to implementation and held regular meetings to discuss difficulties of the intervention (Brovelli et al., 2017). Another study assessed clinicians' fidelity through patient's recall of practice (Boudreaux et al., 2020). The coding scheme and operationalized definitions that guided outcomes categorization can be found in Appendix 5.

As meta-analysis is beyond the extent of scoping reviews, I will instead highlight directions of effect to describe impact of interventions (Table 4-10). Eight studies reported positive directions in the changes in clinicians' instrumental knowledge use with statistical significance (Betz et al., 2015; Boudreaux et al., 2016; Crawford et al., 1998; Currier et al., 2012; Dennis M. et al., 2001; Lebo, 1995; Reshetukha et al., 2018; Stone & Szmukler, 2002). Currier et al. (2012) used self-report assessments to evaluate clinicians' practice change, whereas the rest of the seven studies evaluated medical charts or documentations. These eight studies' interventions had a range of one to six intervention functions, and *Education* was present across all eight interventions, *Environmental restructuring* was present in six studies and *Training* was present in five studies. Six studies reported positive directions in the changes in clinicians' conceptual knowledge

use with statistical significance (Currier et al., 2012; Giordano R. & Stichler J., 2009; Horwitz et al., 2011; Kawashima et al., 2020; Kishi et al., 2014; Mcallister & Billet et al., 2009). These six studies' interventions consisted of two or five intervention functions, and *Education* and *Training* were found across all six interventions. Three studies showed positive directions in clinicians' instrumental knowledge use, but the results were not significant (Ahn et al., 2020; Cracknell , 2015; DeVylder et al., 2020). These three studies' interventions had a range of one to three intervention functions. Both Ahn et al. (2020) Cracknell (2015) used *Environmental restructuring,* and both Cracknell (2015) and DeVylder et al. (2020) used *Training*. Two studies showed positive directions in clinicians' conceptual knowledge use, but the results were not significant (Beaver, 2016; Suokas et al., 2009). These two studies had two or three intervention functions. Studies also showed mixed results related to the changes in clinicians' conceptual knowledge use (Appleby et al., 2000; Lamb et al., 2006; McAllister et al., 2008; Mueller et al., 2020; Turnbull G. & Chalder T., 1997; van Landschoot et al., 2017) and instrumental knowledge use (Lygnugaryte-Griksiene & Leskauskas, 2018; Morgan & Coleman, 2000; Wiesel Cullen et al., 2020).

Table 4-10. Reported Outcome Measures Found in 42 Studies

Author, Year	**R**each	**E**ffectiveness												Adoption	Implementation	Maintenance
		Clinician level				Patient level					Organization/system level					
		Conceptual knowledge use (proximal behaviour change)	Instrumental knowledge use (observable behaviour change)	Direction of effect	Statical significance	Patient reported outcome measure (PROM)	Patient reported experience measure (PREM)	Patient outcomes	Direction of effect	Statical significance	Resource utilization, coverage, access, use	Direction of effect	Statical significance			
Total count	**5**	**22**	**24**			**1**	**2**	**1**			**6**			**5**	**2**	**0**
Ahn et al., 2020			✓	+	no						✓	+	yes			
Appleby et al., 200	✓	✓		mixed	mixed						✓	+	no test			
Ballard et a., 2017			✓	n/a	no test											
Beaver 2016	✓	✓		+	no											
Betz et al., 2015		✓	✓	mixed, +	yes, yes											
Boudreaux et al., 2020		✓	✓	NR											✓	
Boudreaux et al., 2016			✓	+	yes											
Brovelli et al., 2017							✓		+	no test					✓	
Canady 2018			✓	+	no test											
Chesin et al., 2017														✓		
Clarke et al., 2002								✓	NR		✓	+	no			
Cracknell 2015			✓	+	no											

Author, Year	**R**each	**E**ffectiveness												**A**doption	**I**mplementation	**M**aintenance
		Clinician level				Patient level					Organization/system level					
		Conceptual knowledge use (proximal behaviour change)	Instrumental knowledge use (observable behaviour change)	Direction of effect	Statical significance	Patient reported outcome measure (PROM)	Patient reported experience measure (PREM)	Patient outcomes	Direction of effect	Statical significance	Resource utilization, coverage, access, use	Direction of effect	Statical significance			
Crawford et al., 1998		✓	✓	mixed, +	mixed, yes											
Currier et al., 2012	✓	✓	✓	+,+	yes, yes											
Dennis et al., 2001			✓	+	yes											
DeVylder et al., 2020			✓	+	no											
Dimeff et al., 2020														✓		
Fendrich et al., 1998		✓	✓	-, -	yes, yes											
Giordano and Stitchler 2009		✓		+	yes						✓	n/a	no test			
Hackfeld 2020		✓	✓	neutral, +	no test											
Horwitz et al., 2011		✓		+	yes									✓		
Huline-Deckens et al., 2007			✓	n/a	no test						✓	n/a	no test			
Kawashima et al., 2020		✓		+	yes									✓		
Kishi et al., 2014	✓	✓		+	yes											
Krishnaiah 2019			✓	+	no test											
Lebo, 1995			✓	+	yes	✓			neutral	no						

Author, Year	**R**each	**E**ffectiveness												**A**doption	**I**mplementation	**M**aintenance
		Clinician level				Patient level					Organization/system level					
		Conceptual knowledge use (proximal behaviour change)	Instrumental knowledge use (observable behaviour change)	Direction of effect	Statical significance	Patient reported outcome measure (PROM)	Patient reported experience measure (PREM)	Patient outcomes	Direction of effect	Statical significance	Resource utilization, coverage, access, use	Direction of effect	Statical significance			
Lygnugaryte-Griksiene et al., 2018			✓	mixed	mixed											
McAllister et al., 2008		✓		mixed	mixed											
Mcallister and Billett et al., 2009		✓	✓	+, neutral	yes, no test											
Mcallister and Molye et al., 2009		✓		+	no test											
Morgan and Coleman 2000			✓	mixed	mixed						✓	+	yes			
Mueller et al., 2020	✓	✓		mixed	no test											
O'Neill et al., 2001		✓		+	no test									✓		
Reshetukha et al., 2018			✓	+	yes											
Runyan et al., 2016			✓	+	no test		✓		mixed	no test						
Stone and Szmukler 2002			✓	+	yes											
Suokas et al., 2009		✓		+	no											
Turnbull and Chalder, 1997		✓		mixed	mixed											
van Landschoot et al., 2017		✓		mixed	no											
Vaughan, 2019			✓	neutral	no											

Author, Year	**R**each	**E**ffectiveness												**A**doption	**I**mplementation	**M**aintenance
		Clinician level				Patient level					Organization/system level					
		Conceptual knowledge use (proximal behaviour change)	Instrumental knowledge use (observable behaviour change)	Direction of effect	Statical significance	Patient reported outcome measure (PROM)	Patient reported experience measure (PREM)	Patient outcomes	Direction of effect	Statical significance	Resource utilization, coverage, access, use	Direction of effect	Statical significance			
Wiesel Cullen et al., 2020			✓	mixed	mixed											
Lamb et al., 2006		✓		mixed	mixed											
n/a: not applicable as study provided one time measurement.																

4.6 Use of Theories, Models, or Frameworks

Of the 66 interventions, nine reported the use of theory. Reported theories, frameworks or models include 'facilitator' model (Allsop, 1990; Armstrong, 1992), established educational theory (Reece & Walker, 1997), the Chronological Assessment of Suicide Events (CASE) model (Shea, 2009), case management model (Great Britain. et al., 1989; Ryan et al., 1991), collaborative assessment and management of suicidality (Jobes & Drozd, 2004), disciplined clinical inquiry conceptual framework (Sanares & Heliker, 2002), the Iowa model (Cullen, 2018), solution focused nursing (McAllister, 2003, 2007), and middle-range predictive theory (Orlando, 1961). Table 4-11 presents the summary of theories, models, and frameworks. Authors often stated interventions were informed by such theory, but the level of detail remained minimal.

Table 4-11. Summary of Reported Theories

Author (year)	Reported theory
Appleby et al. 2000	'Facilitator' model, Established educational theory
Beaver 2016	The Chronological Assessment of Suicide Events (CASE) model
Clarke et al., 2002	Case management model
Dimeff et al., 2020	Collaborative Assessment and Management of Suicidality
Giordano R.; Stichler J.F. 2009	Disciplined Clinical Inquiry conceptual framework
Hackfeld 2020	The Iowa Model
McAllister et al., 2008; McAllister, Billett, et al., 2009; McAllister, Moyle, et al., 2009	Solution Focused Nursing
Vaughan 2019	The middle-range predictive theory

4.7 Summary

This scoping review included a total of 70 citations, 41 from the database search and 29 from the targeted Google search. Of the 70 citations, there were 66 interventions,

which were predominantly from the USA. Sixty-six interventions were diverse in their mechanisms to change clinicians' behaviour; they often consisted more than one BCW intervention functions to target more than one determinant of behaviour change. Interventions most commonly consisted *Education* and *Training,* and targeted changes in clinicians' knowledge and skills. There was no intervention that consisted of *Coercion* or *Restriction*.

Forty-two studies reported outcomes measures of different levels, all of which were organized in the expanded RE-AIM framework. Predominantly, studies reported outcomes of effectiveness at clinician level; 24 reported measures of instrumental knowledge use and 22 reported measures of conceptual knowledge use. Only four studies reported outcomes of effectiveness at patient level, such as PROM, PREM or patient outcomes. Six studies reported outcome measures at organization level, and 12 studies reported outcomes including measures of reach, adoption, and implementation.

CHAPTER FIVE: DISCUSSION

5.1 Scoping Review Results

This review identified a total of 66 interventions that targeted ED clinicians' behaviour change related to suicide prevention. Most of the interventions were from North America, commonly studied in urban settings. However, the results should be interpreted with caution because the search strategy was limited to English language. Furthermore, nurses and physicians were the most common targets for behaviour change across the 42 included studies. This may be because all EDs, at minimum, have nurses and physicians, and not all EDs have other health professionals such as social workers and psychiatrists. The interventions were made up of combinations of diverse mechanisms (intervention functions) to change clinicians' behaviour related to suicide prevention. However, *Education* and *Training* were used most frequently. Studies predominantly reported outcomes at the clinician-level, and very few studies reported patient and implementation outcomes. As meta-analysis is beyond the scope, this scoping review could not make a definite conclusion about the effectiveness of interventions nor make practice recommendations. However, this review generated a profile of existing interventions that target ED clinicians' behaviour change. This review serves as a foundation for future research as it provides theory-based suggestions and identifies specific areas of improvement in the topic of behaviour change interventions for ED-based suicide prevention care.

5.2 Interventions to Change Clinicians' Behaviour Related to Suicide Prevention Care (Review Question 1)

A majority of the interventions (75.7%) were related to suicide risk screening and assessment. This finding is not surprising because screening and assessment are best practices for suicide prevention in the ED, and identifying those at risk is a critical first step (Betz & Boudreaux, 2016; Petrik et al., 2017; Wilson et al., 2019). A brief intervention such as safety planning intervention is also known as best practice for suicide prevention (Stanley & Brown, 2012). However, only 36.4% of the included interventions addressed clinicians' behaviour change related to brief interventions. Similarly, less than half (43.9%) of the interventions addressed clinician's disposition and discharge planning behaviour, which includes making follow-up plans and referrals. Patients are at the highest risk of subsequent SRTB within the first three months following an attempt (Monti et al., 2003), which is why safety planning interventions and discharge planning are critical. More research on changing clinicians' behaviour related to brief interventions and discharge planning is warranted.

Most notably, there were limited interventions targeting clinicians' behaviour change related to empathetic care and therapeutic relationship in the context of suicide prevention (9.1%). Along with other types of interventions, this is a pressing area for future research. Regardless of the types of interventions being delivered to patients, empathetic care is at the core of clinical practice (Betz & Boudreaux, 2016; Wilson et al., 2019). Building trust is important for clinicians because patients may not openly communicate their suicide plans, thoughts and attempts (Kemball et al., 2008). Even if clinicians have the knowledge and skills to conduct risk assessments and provide safety

planning interventions, it may be challenging to provide the best care without building therapeutic rapport with patients. Furthermore, EDs are often portrayed as busy places for treating life-threatening physical illnesses, and many ED clinicians believe that they do not have time to build rapport with patients (Kuhlmann et al., 2009; Nyström et al., 2003). However, ED clinicians have an important role in recognizing the patient as a person first before assessing patients' risk of suicide (Shin et al., 2020). There is an urgent need for the design and evaluation of interventions that incorporate empathetic care in the context of suicide prevention. For example, future research can add the concept of empathy to other types of interventions, including risk screening and assessment, brief interventions and discharge planning to understand the impact on health outcomes.

Suicide prevention has been a priority research topic for a relatively short period of time, with increased interest in more recent years. It was 2008 when the WHO proposed the Mental Health Gap Action Programme and identified suicide as one of the main health priorities (WHO, 2008). In this scoping review, more than half (60%) of the 42 included studies were from the past decade, 2010-2020. There were 17 studies published between 2010-2019 and eight from 2020, and likely, interventions are currently being tested. The increasing volume of literature in this area may signal the need for a living systematic review to ensure the timely inclusion of new evidence into policy and practice decision making. Therefore, a future knowledge synthesis is warranted to revisit the breadth of literature on this topic.

5.2.1 Mechanisms of Intervention: Putting it All Together and Making Sense with the Behaviour Change Wheel

In an effort to understand how the identified interventions can address existing barriers to suicide prevention, we need to map intervention functions according to their target behavioural determinants (Michie et al., 2011). As presented in the results section (Chapter 4), there were seven mechanisms across the 66 interventions and the frequency of each mechanism was: *Education* (n=48), *Persuasion* (n=21), *Incentivization* (n=2), *Training* (n=40), *Environmental restructuring* (n=18), *Modeling* (n=7), and *Enablement* (n=36). According to Michie et al., (2011) each intervention function (mechanism) targets a combination of different behavioural determinants (COM-B): physical capability, psychological capability, physical opportunity, social opportunity, autonomic motivation, and reflective motivation. As outlined in section **2.2**, we mapped existing barriers experienced by ED clinicians according to these COM-B determinants.

Table 5-1 is directly derived from the work by Michie et al. (2011) and presents a matrix of COM-B behavioural determinants linked to the most relevant intervention functions based on expert consensus and reliability testing. The blue boxes represent relevant intervention functions that address each COM-B behavioural determinant. By using the matrix, one can identify combinations of relevant intervention functions that address specific determinants of behaviour change. For example, informed by this matrix, intervention designers may select the intervention functions of *Education* and *Training* to target improvement in an individual's knowledge and skills (psychological capability). When there is an additional barrier, such as a lack of time (physical opportunity), for clinicians to engage in a certain behaviour, intervention designers can introduce a care

coordinator to manage the workflow more efficiently and help spare time for clinicians to engage in the target behaviour (*Environmental restructuring*). The presence of blue boxes does not necessarily mean that indicated intervention functions are all required to bring about change in the target behaviour; instead, they represent possible choices based on current evidence, which give intervention designers flexibility in selecting appropriate and feasible interventions for a given context (Michie et al., 2011).

Table 5-1. COM-B Matrix and Suggested Intervention Functions (blue) by Michie et al., (2011, p. 116)

COM-B	Suggested BCW Intervention Functions								
	Education	*Persuasion*	*Incentivization*	*Coercion*	*Training*	*Restriction*	*Environmental Restructuring*	*Modelling*	*Enablement*
Physical capability					■				■
Psychological capability	■				■				■
Physical opportunity					■	■	■		■
Social opportunity						■	■	■	■
Autonomic motivation		■	■	■	■		■	■	■
Reflective motivation	■	■	■	■					

We can map the identified intervention functions across the existing barriers using Michie et al.'s (2011) framework to evaluate the state of existing interventions. Table 5-2 is a modified version of Table 5-1, where I added a column on the left and mapped existing barriers experienced by ED clinicians related to suicide prevention according to the COM-B determinants, as outlined in section **2.2**. I also added numbers (n) and

percentages (%) of intervention functions identified from the included 66 interventions. The purpose of Table 5-2 is to illustrate the proportion of the mechanisms (intervention function) reflected in the existing interventions that target ED clinicians' behaviour change related to suicide prevention. Table 5-2 highlights the availability of interventions that map onto known barriers, represented in blue, and the absence of specific intervention functions for known barriers, represented in red.

Table 5-2. COM-B Matrix and Nine Intervention Functions

Existing Barriers (Section 2.2)	COM-B	Suggested BCW Intervention Functions								
		Education n=48 (72.7%)	*Persuasion* n=21 (31.8%)	*Incentivization* n=2 (3.0%)	*Coercion* n=0	*Training* n=40 (60.6%)	*Restriction* n=0	*Environmental restructuring* n=18 (27.3%)	*Modelling* n=7 (10.6%)	*Enablement* n=36 (54.5%)
	Physical capability									
Lack of knowledge, interpersonal/ cognitive skills	Psychological capability									
Lack of time, resources, physical support	Physical opportunity									
Social influences, stigma, lack of social support	Social opportunity									
Negative emotions and attitudes	Autonomic motivation									
Skepticism, lack of confidence, perceived knowledge	Reflective motivation									

As shown in Table 5-2, *Education* can help clinicians overcome barriers related to lack of knowledge and skills, and by gaining more knowledge and skills, clinicians can have more confidence and better self-efficacy. *Training* can help clinicians' build skills and techniques, and constant practice of techniques will help with habit formation. A large proportion of interventions were *Education (*72.7%*)* and *Training (*60.6%*)*. These

interventions commonly provided information and instructions through educational meetings, teaching modules, written handouts or posters.

Persuasion can be used in an intervention to provoke emotional response to motivate clinicians. There were 21 interventions (31.8%) that used *Persuasion*, and it was never used alone but in combination with other intervention functions. For example, SPRC (2008) incorporated this emotional statement in the educational poster: "10% of all ED patients are thinking of suicide, but most don't tell you. Ask questions—save a life." Not only this statement shared salient information to induce emotional response from clinicians, but it also tried to shape positive beliefs about the consequences of engaging in suicide risk assessment. This was one way to overcome skepticism and improve clinicians' 'buy-in' with suicide prevention. *Persuasion* also included providing feedback on clinicians' behaviour, either about their compliance rate (Ballard et al., 2017) or after role-playing activities (Appleby et al., 2000; Boudreaux. et al., 2020), and providing feedback can reinforce clinicians to perform the target behaviour.

Incentivization uses social or physical rewards to encourage clinicians to engage in the target behaviour. For example, by providing positive reinforcement through verbal praise, we can help clinicians overcome negative emotions associated with suicide prevention. There were only two interventions (3.0%) that utilized *Incentivization,* and they provided a certificate for completing an online course (TSPN, n.d.) or small incentives, such as $5 gift cards and lunches, to promote clinicians' performance (Boudreaux et al., 2016).

Environmental restructuring refers to making changes in social and/or environmental context, and they work at an organizational level. This includes making

small or major changes in the environment, such as placing posters or deploying more staff. Eighteen interventions (27.3%) out 66 interventions consisted of *Environmental restructuring*, and this type of intervention can help clinicians overcome organizational barriers related to lack of time, resource and support. For example, EDs introduced a new care team (Ahn et al., 2020; Boudreaux et al., 2016; Chesin et al., 2017; Clarke et al., 2002; Morgan & Coleman, 2000; Suokas et al., 2009), or extended mental health specialist hours (Dennis et al., 2001; Wiesel Cullen et al., 2020). Some studies also made changes in their electronic health record system to remind clinicians to engage in a target behaviour (Ballard et al., 2017; Boudreaux et al., 2020; Canady, 2018). As such, *Environmental restructuring* works at an organizational level to bring about change in individual clinicians' behaviour.

Enablement is a versatile function that can have an impact on one's capability, motivation, and opportunity, and 54.5% of the included interventions had this mechanism to change behaviour. *Emblement* is a special type as it can increase one's capability beyond what *Education* and *Training* can do or increase one's opportunity beyond what *Environmental restructuring* can do to bring about change in behaviour. *Enablement* can be seen as physical or social support for clinicians because it can either remove barriers or enhance enablers for clinicians and help them engage in target behaviour. For example, ED clinicians were given access to mental health experts (social support), and clinicians were encouraged to seek help from the experts for any questions about suicide prevention (Dennis et al., 2001). Also, there was a downloadable mobile app made for ED physicians to access a suicide management tool easily, anywhere and anytime (ACEP 2018, 2020).

Lastly, intervention designers can add *Modelling* in an intervention to help clinicians overcome social stigma and/or negative emotion associated with target behaviour. Seven interventions (10.6%) consisted of *Modelling*. In one study, a video featured an ED nurse educator demonstrating risk assessment using the Ask Suicide-Screening Questions, which provided workshop attendees with a familiar nurse for them to model (Hackfeld, 2020). Other example of *Modelling* includes role-playing activities. Table 5-3 presents examples of interventions with representative quotes of intervention functions. Appendix 10 presents more example quotes.

Table 5-3. Examples of Interventions with Representative Quotes

	Author (Year)	Descriptions of interventions from the literature	Intervention functions
Example Intervention 1	Morgan and Coleman, 2000	"provision of a deliberate self-harm assessment service consisting of an appointment of 'liaison nurse' along with the creation of a team of nurses and medical staff."	Environmental restructuring + Enablement
Example Intervention 2	O'Neil et al., 2001	"Educational in-services included a review of the CPG, how to perform patient searches, de-escalating techniques, risk factors for suicide, and other psychiatric issues."	Education + Training
Example Intervention 3	SPRC, 2011	"This webinar presents a cross-section of promising and evidence-based strategies for preventing suicide among patients visiting the ED, including continuity of care." "Consumers and family members also reported negative experiences involving a perception of unprofessional staff behavior, feeling the suicide attempt was not taken seriously, and long wait times"	Education + Persuasion

	Author (Year)	Descriptions of interventions from the literature	Intervention functions
Example Intervention 4	Dennis et al., 2001	"All new senior house officers were required to attend a one-to-two-hour training seminar conducted by a senior lecturer in psychiatry. The seminar included information on the epidemiology of DSH, the principles and purpose of risk assessment, the psychosocial assessment itself, and the service offered by the local specialist DSH team." "…we encouraged staff to use a pre-printed checklist for risk assessment… The checklist contains… a brief history of the DSH [Deliberate Self Harm] event; previous medical and psychiatric history; social circumstances and background." "… the workings hours of the specialist DSH team were extended from a normal 9 am to 5 pm service to include weekday evenings until 9 pm. DSH team members will provide mental health assessments on patients presenting with self-harm if requested by A&E medical staff. A&E medical staff were also encouraged to contact the team and ask for supervision in assessment of cases if required."	Education + Training + Enablement + Environmental restructuring
Example Intervention 5	Hackfeld, 2020	"Educational interventions were created and included: (a) creation of a computer-based PowerPoint education module with audio to explain the evidence behind and benefits of suicide screening in the ED; (b) a video presentation depicting the administration of ASQ and how to support a concerned parent; and (c) a handout guiding documentation in the EMR." "The handouts were distributed and available at each nursing station." "Next, a 5-minute video presentation was created …to demonstrate how to administer ASQ using the script and address the concerns of an upset parent. The ED educator participated in the video by administering the ASQ, which provided a familiar nurse for the ED staff members to model." "A script was created and included in the electronic medical record (EMR) assessment to assist ED nurses in administering the suicide screening questions."	Education + Training + Environmental restructuring + Enablement + Modelling
Example Intervention 6	Boudreaux et al., 2020	"The intervention consisted of refresher training on universal screening, new training on the [Safety Planning Intervention] SPI and using [Continuous Quality Improvement Approach] CQI teams (called "Lean Teams") to identify and remediate care gaps, and to monitor, improve, and sustain these efforts."	Education + Training + Modelling + Enablement

	Author (Year)	Descriptions of interventions from the literature	Intervention functions
		SPI: "The in-person workshop focused on skills necessary to implement safety planning and utilized didactics, review of the manual, live and/or recorded modeling demonstration, and participant role-playing. Each site trainer was tasked with training other clinicians and helping to oversee implementation of the SPI" Competence in the SPI for the site trainer was determined through role playing of a standardized patient, a common method for establishing competence when actual observation or recordings with patients are impossible." Screening: "Electronic health record integration (ranging from simple integration of the screening items only through programming of "hard stops" that mandated screening completion), ongoing training, data reporting and feedback, and spot checks with frontline staff."	+ Environmental restructuring + Persuasion

5.3 Clinicians' Behaviour Change and Areas of Improvement

The included 66 interventions most commonly consisted of *Education* (72.7%) and *Training* (60.6%), which targeted ED clinicians' knowledge and skills related to suicide prevention. This is consistent with the current literature; *Education* and/or *Training* are frequently used in implementation practice and knowledge translation (Abraham et al., 2020; Pollmann et al., 2015; Spoon et al., 2020). In a previous scoping review of deprescribing benzodiazepine interventions, *Education* and *Training* were frequent elements found in behaviour change interventions targeting clinicians (Pollmann et al., 2015). Similarly, a review of interventions related to reducing physical restraints practice found that educating clinicians was the most commonly used strategy (Abraham et al., 2020). This is not surprising because educational meetings and training workshops are less expensive and relatively easier to execute in comparison to more complex interventions that require organizational change (Gagliardi, 2012).

Human behaviour is complex, and it is important to remember that changing individuals' knowledge and/or skills (capability) does not always guarantee observable behaviour change (Michie et al., 2011). Furthermore, sole reliance on passive approach to education, like providing information and instructions do not effectively change clinicians' behaviour (Forsetlund et al., 2009; Grimshaw et al., 2001). One of the suggested methods to increase effectiveness of education in changing clinicians' behaviour is mixing interactive and didactic formats (Forestland et al., 2009). The BCW *Modelling* (e.g., role-playing activities, demonstration) and *Persuasion* (e.g., feedback on behaviour) are optional addendums to *Education* and/or *Training*. Furthermore, *Modelling* and *Persuasion* can influence behavioural determinants (Motivation and Opportunity) that *Education* and *Training* may not address. The use of *Modelling* and *Persuasion* can be useful to leverage clinicians' motivation because ED clinicians have shown to have a strong commitment to best practice and patient outcomes (Jabbour et al., 2018). Furthermore, a systematic-meta review also identified that clinicians' motivation was one of the most common enablers for implementing a clinical guideline (Correa et al., 2020). As such, in consideration of ED clinicians' skepticism and negative emotion towards suicide prevention, future research can leverage clinicians' motivation to address such barriers.

Changing clinicians' behaviour continues to be an area of research as there is no definite answer as to what the most effective strategy is. Multi-component interventions are generally more effective than single-component interventions in changing behaviour (Grimshaw et al., 2001). However, adding more components to interventions does not necessarily create a better strategy for changing behaviour (Grimshaw et al., 2006;

Mansouri & Lockyer, 2007). Based on what we know from the current research, tailored strategies that target specific barriers have a high potential to improve clinical practice (Baker et al., 2010). In other words, selection of intervention functions needs to be intentional and purposive. As there are both individual and organizational barriers experienced by ED clinicians in providing suicide prevention care, we need to tailor interventions to address barriers in a given context.

This review mapped the 66 interventions according to their mechanisms for changing behaviour in an effort to understand the alignment of interventions to known barriers. Table 5-2 presented proportions of intervention functions reflected in the existing literature, illustrating the availability and absence of interventions matching particular barriers. Types of intervention functions reflected in the current literature were diverse, highlighting potential to overcome both individual and organizational barriers to suicide prevention. However, *Education* and *Training* outnumbered *Modelling*, *Persuasion*, *Environmental restructuring,* and *Incentivization*, and no intervention consisted of *Restriction* and *Coercion*. This highlights opportunity for future research; as there are many ways to change human behaviour, we should refrain from relying solely on targeting clinicians' capability. One should strategically add different intervention functions to target specific barriers in a given context.

An ED is a unique health care setting where it is busy and often described as "chaotic" (Goldman Ellen et al., 2009; Kim et al., 2020). Unlike the inpatient settings, EDs cannot alter daily patient volume and must maximize their efficiency. The time pressure that ED clinicians experience is one of the barriers to providing optimal suicide prevention care (Betz et al., 2010; Conlon & O'Tuathail, 2012; Petrik et al., 2015; Roy et

al., 2017). A busy ED environment cannot be ignored because it has shown to significantly affect clinicians' memory and attention (MacWilliams et al., 2017). As such, future solutions should not overburden ED providers who are already busy. Furthermore, other contextual factors, including organizational culture, cannot be overlooked (Grol & Wensing, 2004). In consideration of the ED context, one can leverage behavioural determinants that work at the organization-level instead of solely focusing on individual-level determinants for behaviour change (e.g., knowledge, skills). Aligned with what current literature describes, context is a critical factor when closing the gap between research and practice (Cassidy et al., 2021; Edwards & Barker, 2014; Tomoaia-Cotisel et al., 2013). *Environmental restructuring* works at the organizational level and can be a good addendum to interventions that only works at the individual level (e.g., *Education*).

Environmental restructuring only represented 27.3% of the 66 interventions, and the interventions identified in this review included deploying a special mental health care team, integrating a reminder in an electronic health care record system, or placing posters. A review of reviews of behaviour change interventions for primary healthcare providers identified 19 reviews (470 studies) that evaluated the impact of *Environmental restructuring* (Chauhan et al., 2017). Examples of *Environmental restructuring* included shared care practices and introducing specialized nurses or other allied healthcare professionals, and the authors found that nurse-led care approaches were effective in terms of patient satisfaction, asthma, cardiovascular, and diabetes management (Chauhan et al., 2017). These examples are similar to some of the 18 *Environmental restructuring* interventions included in this scoping review. Therefore, *Environmental restructuring* is a promising option in the ED if organizational change is required and feasible. However,

we need a growing body of evidence to further evaluate its effectiveness in the context of suicide prevention. Future high-quality studies using *Environmental restructuring* in EDs related to suicide prevention care will be useful.

5.4 Reported Outcome Measures and Levels of Impact (Review Question 2)

This review did not include studies that exclusively looked at patient-level outcomes, such as studies testing the efficacy of a risk assessment tool, because there is no indication of changing clinicians' behaviour. However, when included studies reported patient-level outcomes, we documented their outcome measures. The majority of the 42 studies reported proximal measures of clinicians' behaviour change and/or observable measures of behaviour change. This was expected because the review primarily focused on identifying interventions targeting clinicians' behaviour change. However, it was surprising to find that most studies assessed interventions' impact on clinicians' behaviour in isolation of patient outcomes. Only four studies in this review reported patient-level outcome measures. This was unexpected because the ultimate goal of changing clinicians' behaviour was to improve patient care and outcomes, and current research did not capture essential evidence of an effect.

Similarly, a previous systematic review of 32 knowledge translation strategies in allied health professions identified only four studies that reported patient-level outcomes (Scott et al., 2012). In another systematic review of interventions for changing community pharmacists' behaviour related to clinical guideline adherence, only three out of 19 studies reported patient-level outcomes (Watkins et al., 2015). Interventions included in this scoping review and knowledge translation strategies included in reviews by Scott et al. (2012) and Watkins et al. (2015) are related to closing the gap between

research and practice, and they are means to improve health outcomes by maximizing the benefits of research evidence (Canadian Institutes of Health Research, 2012). However, it remains challenging to make an informed and evidence-based decision about patient care without knowing the impact that clinicians' behaviour change has on patients. For example, decisions to execute an educational meeting for clinicians are not evidence-based when we do not know its impact on patients. The ultimate goal for changing ED clinicians' behaviour is to improve patient health outcomes related to SRTB, and future studies should measure patient-level outcomes alongside clinician-level outcomes.

Across the 42 studies, 12 reported outcome measures related to reach, adoption, feasibility and fidelity, and no study measured maintenance. These measures are related to implementation process or sustainability of interventions. Measures of implementation are as important as intervention effectiveness because implementation is a known determinant of effectiveness, meaning interventions will not be effective when not implemented even if interventions have known effectiveness (Proctor et al., 2011). Consistent with Rycroft-Malone and colleagues' (2016) suggestions, implementation process needs researchers' attention. Traditionally, interventions have been portrayed as a "black box" in literature because the evaluation of interventions usually happened without knowing what actually happened and how and why outcomes were affected (Harachi et al., 1999). Intervention functions identified in this review helped us understand how an intervention might change clinicians' behaviour. However, we need to better understand the implementation process, and this is an area of improvement for future research.

In recognition of the complex nature of translating research to bedside (Kitson et al., 2018), we need to evaluate the implementation process alongside the effectiveness of intervention and specify areas of improvement. A large body of literature describes the research to practice gap, and it takes an average of 17 years to translate research into routine practice (Balas & Boren, 2000; Morris et al., 2011). Aside from individual and organizational level barriers, Glasgow et al. (2003) argued that the time lag is also attributed to the traditional approach of intervention research: stepwise progressions of research from clinical efficacy, effectiveness, and then to implementation. One strategy to overcome this time lag and accelerate the translation of research findings into practice is to utilize an effectiveness-implementation hybrid method, which has a dual focus on assessing effectiveness and implementation in one study (Curran et al., 2012).

5.5 Interventions and Theory

A clear rationale for intervention design involves using a tailored approach, empirical justification, and/or theoretical framework (Proctor et al., 2013). Of the 66 interventions, only nine studies reported theories, models, or frameworks. However, it is impossible to distinguish if authors are not reporting the theory or not using the theory. Future studies can directly contact the authors of the papers and retrospectively investigate the theoretical basis of the interventions. Due to the limited reporting in the current literature, how and the degree of theory involvement in intervention design remains unknown.

Despite the existing suggestions for reporting clear description of intervention design and theoretical basis (Davies et al., 2010; Liang et al., 2017), the current literature continues to make the same mistake. There is a significant number of theories, models,

and frameworks – approximately over 100 – currently available for implementation research (Nilsen, 2015). However, limited reporting on theories in the intervention research has been an area of improvement for many years. This current scoping review also showed a lack of evidence-base describing theory use. A previous review also identified a total of 159 knowledge translation theories, models and frameworks, and 87% of the them were used in five or fewer studies and 60% of them were only used once (Strifler et al., 2018). As such, future research should improve reporting of theoretical justification for intervention design. For example, one can utilize reporting guideline, such as the GUIDED (GUIDance for the rEporting of intervention Development) checklist (Duncan et al., 2020), or recommendations provided by Proctor et al. (2013).

There is no "perfect" theory, but there is general guidance to support the selection of theory to meet different research goals (Esmail et al., 2020). Furthermore, we need a growing body of evidence describing application of theory in research. Therefore, better reporting of theories can allow meta-analysis and increase comparability of theories. As this review applied the BCW retrospectively to existing interventions that target clinician's behaviour change related to suicide prevention, future research can continue to use the BCW and make theory-based choices for intervention.

5.6 Implications for Future Research

5.6.1 Research Design, Methodological Quality and Future Knowledge Synthesis

Included studies varied in design and quality and based on the methodological assessment (section ***4.2.5*** and Appendix 8), we need more rigorous studies to improve the quality of evidence base. We need more high-quality research in this topic area and perform meta-analysis to make practice and policy recommendations. For example,

future experimental studies need to measure outcomes in a reliable way and improve transparency in the characteristics of comparison.

One of the weakness of the BCW is the oversimplification of human behaviour although one can see this parsimony as a strength of the framework (Michie et al., 2011). In consideration of this weakness, we need more qualitative research to obtain ED clinicians' perspective and better understand what constitutes their engagement in target behaviour and how certain interventions affect them. Qualitative evidence can add a layer of complexity and provide better understanding of interventions' mechanisms in terms of ED clinicians' behaviour change.

To our knowledge, this review is the first to identify behaviour change interventions for ED clinicians pertaining to suicide prevention and to apply the BCW to describe intervention characteristics. In contrast to systematic reviews, the scoping review methodology served to fulfil a broad purpose of the current study (Munn et al., 2018). Suicide prevention has been a priority research topic for a relatively short period of time, and most likely behaviour change interventions are currently being tested. Therefore, a future knowledge synthesis is warranted to revisit the breadth of literature on this topic. Furthermore, this review presented a wide range of different intervention types and mechanisms to change ED clinicians' behaviour. Such heterogeneity suggests the need for future systematic reviews to tease apart commonalities and specificities in this complex topic area and assess the extent to which intervention functions can be generalized in ED settings.

5.6.2 Theory-Based Suggestions for Future Research

Firstly, the types of intervention functions reflected in the current literature were diverse, but *Education* and *Training* outnumbered other types. There are many ways to change human behaviour, and we should refrain from relying solely on targeting clinicians' capability because exclusively influencing one's capability (knowledge and skills) does not necessarily lead to successful behaviour change (Michie et al., 2011). Future research should strategically consider diverse intervention functions to target both individual- and organization-level barriers for a given context. Secondly, the ultimate goal for changing ED clinicians' behaviour is to improve patient health outcomes related to SRTB, but current research has evaluated clinicians' behaviour in isolation of patient outcomes. Future studies should measure patient-level outcomes alongside clinician-level outcomes. Thirdly, future research should assess the implementation process in addition to the effects of interventions. Translating evidence into practice is not a linear process. Therefore, researchers need to be mindful of the complex nature of implementation and better understand what actually happened and how and why outcomes were affected during the implementation process. Lastly, future research should improve reporting of theoretical justification for intervention design. Better reporting of theories can contribute to the growing body of evidence, allow meta-analysis, and increase comparability of theories. Also, intervention research should use theory if they are not being used already. This review applied the BCW retrospectively to existing interventions that target clinician's behaviour change related to suicide prevention, and future research can continue to use the BCW.

5.6.3 Comparative Effectiveness and Identifying Active Ingredients

In the future, it will be useful to identify comparative effectiveness of different interventions functions and combinations of intervention functions on the behavioural determinants of suicide prevention in the ED. Assessing for effectiveness is beyond the scope of this project, and it remains unknown whether use of *Education* and *Training* are more effective than *Education* alone in changing ED clinicians' behaviour related to suicide prevention. It will be useful to identify "active ingredients" of interventions, which requires further dissecting intervention functions in a granular level of behaviour change techniques (Michie et al., 2013). Previous reviews have used the taxonomy of behaviour change techniques and found it effective in describing interventions in more detail in common behaviour terms (Presseau et al., 2015). Identification of "active ingredients" can provide a better understanding of the mechanisms of interventions and enhance scholarly communication and replication (Michie et al., 2013).

Systematic reviews can give more definite answers about interventions' causal mechanisms, outcomes and effectiveness (Aromataris & Pearson, 2014). Also, we need systematic reviews to inform practice and policy (Aromataris & Pearson, 2014). Along with a more rigorous evidence base, it will be useful in the future to conduct a systematic review to identify "active ingredients" of interventions that are effective for changing clinicians' behaviour as well as improving patient health outcomes. For example, a previous systematic review of weight loss interventions identified four "active ingredients" (behaviour change activities) of interventions; this review found that "providing instructions," "self-monitoring," "relapse prevention" and "prompting practice" were moderately effective strategies for reducing weight (Dombrowski et al.,

2012, p.24). As such, it will be helpful to identify "active ingredients" that can be generalized in ED settings related to suicide prevention.

5.7 Strengths and Limitations

One of the strengths in this scoping review is the use of complementary strategy (Godin et al., 2015) for grey literature search and the inclusion of diverse sources of evidence. Instead of relying on peer-reviewed research evidence, this review included theses, conference abstract, and also identified interventions from the relevant ED organization websites. In doing so, this scoping review mitigated the potential impact of publication bias. Secondly, the application of the BCW added strengths to this scoping review. By retrospectively applying the BCW to the existing interventions and barriers, the review provided theory-informed suggestions for future research.

It is important to remember that search was limited to the English language, and this may explain why there were many interventions from English-speaking countries including USA, UK, and Australia. Critical appraisal is one of the strengths as we identified gaps in the methodological quality. However, we did not exclude any studies based on the methodological quality, and therefore, there may be a risk of bias in our data. Furthermore, meta-analysis is beyond the scope of scoping reviews, and without a meta-analysis, we cannot assess the effectiveness of the interventions. Therefore, the results of reported outcomes and directions of effectiveness should be interpreted with caution. Coding data using the BCW depended on the reported content of the intervention descriptions, which is a frequently encountered limitation when using behaviour framework (Presseau et al., 2015). Lastly, there was a limited understanding of the interventions identified from the targeted Google search. Other than one intervention that

was used in the USA (Currier et al., 2012) and Belgium (van Landschoot et al., 2017), we do not know where and how the rest of the 27 interventions are being used in the ED settings.

CHAPTER SIX: CONCLUSION

This scoping review's main objective was to explore the breadth of literature on interventions targeting ED clinicians' behaviour change related to suicide prevention. To my knowledge, this review is the first to examine behaviour change interventions for ED clinicians pertaining to suicide prevention and to apply the BCW to characterize interventions. This review identifies the gap in the suicide prevention synthesis literature as previous reviews have not yet systematically and theoretically explored the interventions that target ED clinicians' behaviour change related to suicide prevention.

Interventions included in this review were diverse and leveraged a range of mechanisms to change ED clinicians' behaviour. However, consistent with intervention studies targeting other ED provider behaviours such as discharge communication (Curran et al., 2019), most interventions solely relied on *Education* and/or *Training* to improve clinicians' knowledge and/or skills (capability). As there are barriers at multiple levels – which hinder ED clinicians from providing suicide prevention care – future studies should strategically select intervention functions and target behavioural determinants other than capability. This review also mapped a range of reported outcome measures, and most surprisingly, studies often reported clinician behaviour change outcomes in isolation of patient outcomes. Future research should assess clinicians' behaviour change alongside with patient-level outcomes because we cannot make an evidence-based decision about patient care without knowing the impact that clinicians' behaviour has on patients. There was also a lack of reporting on implementation outcomes and theory use. Implementation process evaluation is as important as the measuring the effectiveness of interventions. Knowledge of both is required to fully understand how and why an

intervention is effective or not. Lastly, we need a growing body of evidence describing theory use, which can help us better understand mechanisms of interventions.

Suicide is a significant public health problem in Canada and across the world, and there is an urgent need to meet the increased demand for suicide prevention. This scoping review generated a profile of existing interventions that target ED clinicians' behaviour change. This review serves as a foundation for future research as it provides theory-based suggestions and identifies specific areas of improvement in the topic of behaviour change interventions for ED-based suicide prevention care. Lastly, this review promotes further high-quality research in this topic area and contributes to the growing body of evidence related to BCW application in intervention research.

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APPENDIX 1. FINAL SEARCH STRATEGIES

Search Strategy for PubMed
Search conducted on July 8, 2020

Search	Query	Records retrieved
#1	("Emergency Service, Hospital"[Mesh])	78,206
#2	("emergency department"[tiab]) OR (“emergency departments”[tiab]) OR ("emergency room"[tiab]) OR (“emergency rooms”[tiab]) OR ("emergency service"[tiab]) OR (“emergency services”[tiab]) OR (ED[tiab]) OR (EDs[tiab]) OR (ERs[tiab]) OR (ER[tiab]) OR ("Accident and Emergency"[tiab]) OR ("A&E"[tiab])	260,390
#3	#1 OR #2	289,925
#4	("Suicide"[Mesh]) OR ("Self-Injurious Behavior"[Mesh])	70,579
#5	(suicid*[tiab]) OR ("self-harm"[tiab]) OR ("self-injury"[tiab]) OR ("self-injurious"[tiab])	83,373
#6	#4 OR #5	103,943
#7	("Education, Continuing"[Mesh]) OR ("Risk Assessment"[Mesh])	328,305
#8	(interven*[tiab]) OR (prevent*) OR (program*[tiab]) OR (screen*[tiab]) OR (“risk assessment”[tiab]) OR (“risk factor”[tiab]) OR (“risk factors”[tiab]) OR (educate[tiab]) OR (education[tiab]) OR (educating[tiab]) OR (train[tiab]) OR (training[tiab]) OR (implement*[tiab]) OR (resource*[tiab]) OR (consult*[tiab])	5,845,259
#9	#7 OR #8	5,997,583
#10	#3 AND #6 AND #9	2,291
#11	#10 AND LA(English)	2,125
No limits were placed on date		

Search Strategy for CINAHL
Search conducted on July 8, 2020

Search	Query	Records retrieved
#1	(MH "Emergency Service") OR (MH "Physicians, Emergency") OR (MH "Emergency Services, Psychiatric") OR (MH "Emergency Nurse Practitioners")	61,013
#2	TI ((“emergency department”) OR (“emergency departments”) OR (“emergency service”) OR (“emergency services”) OR (“emergency room”) OR (“emergency rooms”) OR (“accident and emergency”) OR (“accident & emergency”) OR (“a&e”) OR ("ED") OR (“EDs”) OR (“ERs”) OR ("ER")) OR AB ((“emergency department”) OR (“emergency departments”) OR (“emergency service”) OR (“emergency services”) OR (“emergency room”) OR (“emergency rooms”) OR (“accident and emergency”) OR (“accident & emergency”) OR (“a&e”) OR ("ED") OR (“EDs”) OR (“ERs”) OR ("ER"))	203,264
#3	#1 OR #2	225,322
#4	(MH "Injuries, Self-Inflicted") OR (MH "Self-Injurious Behavior") OR ((MH "Suicide") OR (MH "Suicide, Attempted") OR (MH "Suicide Prevention (Iowa NIC)") OR (MH "Suicidal Ideation")	34,770
#5	TI ((“self-harm”) OR (suicid*) OR (“self-injury”) OR (“self injurious”)) OR AB ((“self-harm”) OR (suicid*) OR (“self-injury”) OR (“self injurious”))	37,983
#6	#4 OR #5	47,275
#7	(MH "Seminars and Workshops") OR (MH "Education, Health Sciences") OR (MH "Education, Emergency Medical Services") OR (MH "Education, Nursing, Associate") OR (MH "Program Implementation") OR (MH "Systems Implementation") OR (MH "Emergency Nursing") OR (MH "Intervention Trials") OR (MH "Crisis Intervention") OR (MH "Nursing Interventions") OR (MH "Crisis Intervention (Iowa NIC)")	91,646
#8	TI ((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR (consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”)) OR AB ((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR	1,736,871

Search	Query	Records retrieved
	(consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”))	
#9	#7 OR #8	1,776,971
#10	#3 AND #6 AND #9	1,532
#8	#7 AND LA(English)	1,451
No limits were placed on date		

Search Strategy for PsycInfo
Search conducted on July 8, 2020

Search	Query	Records retrieved
#1	(DE "Emergency Medicine") OR (DE "Emergency Personnel") OR (DE "Emergency Services")	8,619
#2	TI ((“emergency department”) OR (“emergency departments”) OR (“emergency service”) OR (“emergency services”) OR (“emergency room”) OR (“emergency rooms”) OR (“accident and emergency”) OR (“accident & emergency”) OR (“a&e”) OR ("ED") OR (“EDs”) OR (“ERs”) OR ("ER")) OR AB ((“emergency department”) OR (“emergency departments”) OR (“emergency service”) OR (“emergency services”) OR (“emergency room”) OR (“emergency rooms”) OR (“accident and emergency”) OR (“accident & emergency”) OR (“a&e”) OR ("ED") OR (“EDs”) OR (“ERs”) OR ("ER"))	164,412
#3	#1 OR #2	167,480
#4	(DE "Suicide") OR (DE "Suicidology") OR (DE "Suicidal Ideation") OR (DE "Suicidality") OR (DE "Self-Inflicted Wounds") OR (DE "Self-Injurious Behavior") OR (DE "Self-Mutilation")	43,830
#5	TI ((“self harm”) OR (suicid*) OR (“self injury”) OR (“self injurious”)) OR AB ((“self harm”) OR (suicid*) OR (“self injury”) OR (“self injurious”))	69,398
#6	#5 OR #6	72,834
#7	(DE "Suicide Prevention") OR (DE "Intervention") OR (DE "Prevention") OR (DE "Training") OR (DE "Educational Programs")	138,199

Search	Query	Records retrieved
#8	TI ((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR (consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”)) OR AB ((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR (consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”))	1,468,953
#9	#7 OR #8	1,475,932
#10	#3 AND #6 AND #9	2,081
#11	#10 AND LA(English)	1,816
No limits were placed on date		

Search Strategy for Embase
Search conducted on July 8, 2020

Search	Query	Records retrieved
#1	('emergency ward'/exp) OR ('emergency health service'/exp)	235,730
#2	('emergency service':ab,ti) OR ('emergency services':ab,ti) OR ('emergency department’:ab,ti) OR ('emergency departments':ab,ti) OR ('emergency room':ab,ti) OR ('emergency rooms’:ab,ti) OR ('accident and emergency':ab,ti) OR ('accident & emergency':ab,ti) OR ('a&e':ab,ti) OR (‘ED’:ab,ti) OR (‘EDs’:ab,ti) OR (‘ER’:ab,ti) OR ('ERs':ab,ti)	413,310
#3	#1 OR #2	512,574
#4	('suicide'/exp) OR ('suicidal behavior'/exp) OR ('automutilation'/exp)	117,967
#5	('self harm':ab,ti) OR (suicid*:ab,ti) OR ('self injury':ab,ti) OR ('self injurious':ab,ti)	105,978
#6	#4 OR #5	143,473
#7	('intervention study'/exp) OR ('implementation science'/exp) OR ('in service training'/exp) OR ('continuing education'/exp) OR ('education program'/exp) OR ('workshop'/exp)	169,165

Search	Query	Records retrieved
#8	(interven*:ab,ti) OR (prevent*:ab,ti) OR (implement*:ab,ti) OR (education:ab,ti) OR (educating:ab,ti) OR (educate:ab,ti) OR (program*:ab,ti) OR (training:ab,ti) OR (train:ab,ti) OR (workshop:ab,ti) OR (resource*:ab,ti) OR (consult:ab,ti) OR (screen*:ab,ti) OR (“risk assessment”:ab,ti) OR (“risk factor”:ab,ti) OR (“risk factors”:ab,ti)	6,510,583
#9	#8 OR #9	6,564,197
#10	#3 AND #6 AND 9	3,389
#11	#10 AND LA(English)	3,171
No limits were placed on date		

Search Strategy for ProQuest Dissertations & Theses Global
Search conducted on July 8, 2020

Search	Query	Records retrieved
#1	ab(("emergency department") OR ("emergency departments") OR ("emergency room") OR ("emergency rooms") OR (“emergency service” OR “emergency services”) OR ("accident and emergency") OR ("accident & emergency") OR ("a&e") OR (“ED”) OR (“ER”) OR (“EDs”) OR (“ERs)) OR ti(("emergency department") OR ("emergency departments") OR ("emergency room") OR ("emergency rooms") OR (“emergency service” OR “emergency services”) OR ("accident and emergency") OR ("accident & emergency") OR ("a&e") OR (“ED”) OR (“ER”) OR (“EDs”) OR (“ERs))	26,816
#2	ab((suicid*) OR (“self harm”) OR (“self injury”) OR ("self injurious")) OR ti((suicid*) OR (“self harm”) OR (“self injury”) OR ("self injurious"))	10,377
#3	ab((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR (consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”)) OR ti((interven*) OR (prevent*) OR (implement*) OR (educating) OR (education) OR (educate) OR (program*) OR (workshop) OR (train) OR (training) OR (resource*) OR (consult) OR (screen*) OR (“risk assessment”) OR (“risk factor”) OR (“risk factors”))	1,339,727

Search	Query	Records retrieved
#4	#1 AND #2 AND #3	110
#5	#4 AND LA(English)	109
No limits were placed on date		

Search Strategy for Scopus
Search conducted on July 8, 2020

Filter applied to locate conference papers

Search	Query	Records retrieved
#1	TITLE-ABS-KEY ("Emergency Service" OR "emergency services" OR "emergency department" OR “emergency departments” OR “emergency rooms” OR "emergency room" OR “EDs” OR "ED" OR "ER" OR “ERs” OR "Accident and Emergency" OR "A&E")	47,182
#2	TITLE-ABS-KEY (suicid* OR "self harm" OR "self injury" OR "self injurious")	3,708
#3	TITLE-ABS-KEY (prevent* OR interven* OR implement* OR educating OR education OR educate OR train OR training OR workshop OR program* OR resource* OR consult OR screen* OR “risk assessment” OR “risk factor” OR “risk factors”)	2,673,474
#4	#1 AND #2 AND #3	48
#5	#3 AND LA(English)	35
No limits were placed on date		

APPENDIX 2. TARGETED GOOGLE SEARCH RESULTS

Search was conducted on Sep 2, 2020
Google Search Engine
Date searched: September 3-4, 2020
Searches "All results" – first 10 pages (100 results) per each search, representing total 1000 results screened

#	Search	# results	# results screened	# new potentially relevant records	Total # records
	Date searched: September 3, 2020				
1	Emergency Department OR Emergency Room OR Accident and Emergency AND suicide prevention AND guidelines OR resources OR programs	~ 73,500,000	100	38	38
	Date searched: September 4, 2020				
2	Suicide OR Self-harm OR Self-injury OR Self-poison AND Emergency department OR Emergency Room OR Accident and Emergency	~ 101,000,000	100	5	43
	Date searched: September 4, 2020	~ 103,000,000	100	7	50
3	Suicide prevention AND policies OR guidelines OR resources OR programs OR training OR education OR Emergency nursing OR Emergency medicine				
	Date searched: September 4, 2020	~ 39,900,000	100	1	51
4	Suicide prevention OR self-harm OR self-injury AND emergency health care professionals OR emergency Health care providers OR Emergency Clinicians AND best practices				
			100	2	53

	Date searched: September 4, 2020				
5	Suicide prevention OR Self-harm OR self-injury OR self-abuse AND Resources AND Emergency Nurses OR Emergency Doctors	~ 69,500,000			
	Date searched: September 4, 2020	~ 50,500,000	100	2	55
6	Suicide prevention AND best practices OR recommendations OR guidelines AND Emergency nursing OR Emergency medicine				
	Date searched: September 4, 2020	~ 138,000,000	100	3	58
7	Suicide OR Self-harm OR Self-injury OR Self-poison OR Self-abuse AND Emergency health care professionals OR Emergency Health care providers AND Training OR Education OR resources				
	Date searched: September 4, 2020	~ 52,000,000	100	0	58
8	Suicide prevention AND Emergency AND health care AND workshops OR training				
	Date searched: September 4, 2020	~ 104,000,000	100	1	59
9	Emergency AND Suicide AND guidelines OR policies				
	Date searched: September 4, 2020	~ 47,800,000	100	7	65
10	Suicide prevention OR Self-harm AND quality improvement AND Emergency Room OR Emergency department OR Accident and Emergency				

APPENDIX 3. WEBSITES IDENTIFIED FROM THE TARGETED GOOGLE SEARCHES

#	Website name/organization	Link
	Date searched: September 3, 2020	
1	Suicide Prevention Resource Centre A Consensus Guide for Emergency Departments pdf	https://www.sprc.org/settings/emergency-departments http://www.sprc.org/sites/default/files/EDGuide_full.pdf
2	Centre for Suicide prevention Preventing Suicide Guidance in Emergency Departments PDF	https://www.suicideinfo.ca/ https://www.suicideinfo.ca/wp-content/uploads/2016/09/Preventing-suicide-guidance-for-emergency-departments_oa.pdf
3	SAMHSA Substance Abuse and Mental Health Services Administration A Guide for Medical Providers in the Emergency Department Taking Care of Suicide Attempt Survivors	https://www.samhsa.gov/ https://store.samhsa.gov/product/A-Guide-for-Medical-Providers-in-the-Emergency-Department-Taking-Care-of-Suicide-Attempt-Survivors/SMA18-4359
4	Health Europa	https://www.healtheuropa.eu/suicide-prevention-emergency-department/87503/
5	AHRQ: Agency for Healthcare Research and Quality	https://www.ahrq.gov/chain/research-tools/featured-certs/opportunities-for-suicide-prevention.html
6	Zero Suicide in Health and Behavioural Health Care TRAINING WORKSHOPS | IMPLEMENTATION TOOLS Preventing Suicide in Emergency Department Patients	https://zerosuicide.edc.org/champions/populations-settings/emergency-department https://zerosuicide.edc.org/resources/preventing-suicide-emergency-department-patients
7	Vancouver Coastal Health	http://www.vch.ca/your-care/emergency-care

#	Website name/organization	Link
8	St. Joseph's Healthcare Hamilton	https://www.stjoes.ca/hospital-services/mental-health-addiction-services/mental-health-services/emergency-psychiatry-services
9	California Hospital Association Emergency Department Toolkit PDF	https://www.calhospital.org/emergency-department-toolkit
10	A Lloydminster Region Health Foundation initiative	https://lloydminstermentalhealth.ca/get-help-now/
11	Suicide Prevention Community Council of Hamilton Hope, Help and Healing	https://spcch.org/
12	Black Dog Institute Guidelines for integrated suicide-related crisis and follow-up care in Emergency Departments and other acute settings pdf	https://www.blackdoginstitute.org.au/ https://www.blackdoginstitute.org.au/wp-content/uploads/2020/04/delphi-guidelines-clinical-summary_web.pdf
13	Health Science North	https://www.hsnsudbury.ca/portalen/Programs-and-Services/Mental-Health-and-Addictions/Crisis-Intervention-Services
14	Canadian Mental Health Association Kelowna	https://cmhakelowna.com/find-help-now/
15	National Suicide Prevention Lifeline Following up with individuals at high risk for suicide pdf	https://suicidepreventionlifeline.org/ https://suicidepreventionlifeline.org/wp-content/uploads/2016/09/Lifeline-Crisis-Center-ED-Paper-1.6.pdf
16	Canadian Mental Health Association Ontario	https://ontario.cmha.ca/
17	Canadian Patient Safety Institute Suicide Risk Assessment Guide A Resource for Health Care Organizations pdf	https://www.patientsafetyinstitute.ca/en/Pages/default.aspx https://www.patientsafetyinstitute.ca/en/toolsResources/SuicideRisk/Documents/Suicide%20Risk%20Assessment%20Guide.pdf

#	Website name/organization	Link
18	Canadian Mental Health Association British Columbia Division	https://cmha.bc.ca/documents/coping-with-mental-health-crises-and-emergencies-2/
19	The Royal Mental Health Care & Research	https://www.theroyal.ca/need-help
20	Island Health	https://www.islandhealth.ca/our-services/mental-health-substance-use-services/crisis-emergency-services
21	St. Michaels	http://www.stmichaelshospital.com/programs/mentalhealth/emergency.php
22	Health Resources & Services Administration Critical Crossroads: Pediatric Mental Health Care in The Emergency Department Pdf	https://www.hrsa.gov/enews/past-issues/2019/september-19/helping-prepare-for-kids-in-crisis https://www.hrsa.gov/sites/default/files/hrsa/critical-crossroads/critical-crossroads-tool.pdf
23	Alberta Health Services	https://www.albertahealthservices.ca/injprev/page4875.aspx
24	Mental Help. Net An American Addition Centres Resource	https://www.mentalhelp.net/blogs/what-to-do-in-a-mental-health-emergency/
25	American College of Emergency Physicians iCar2e Practical Solutions to Boarding of Psychiatric Patients in the Emergency Department pdf Suicide Prevention Awareness	https://www.acep.org/patient-care/iCar2e/ https://www.macep.org/Files/Behavioral%20Health%20Boarding/Practical%20Solutions%20to%20Boarding%20of%20Psych%20Patients%20in%20EDs.pdf https://www.acep.org/how-we-serve/sections/wellness/suicide-prevention-awareness/
26	A manual for emergency room social workers pdf	https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=3835&context=open_access_etds
27	Trillium Health Partners	https://trilliumhealthpartners.ca/aboutus/Pages/Overview.aspx

#	Website name/organization	Link
28	The Sullivan Group	https://www.thesullivangroup.com/RSQSolutions/rsq-corner/risk-resources/
29	Psychiatry Times	https://www.psychiatrictimes.com/view/youth-suicide-screening-pathway
30	The Grande Prairie Regional Emergency Partnership	https://www.gprep.ca/covid19/mentalhealth/
31	National Association of State Mental Health Program Directors	https://www.nasmhpd.org/
32	The Joint Commission Suicide Prevention Resources to support Joint Commission Accredited organizations implementation of NPSG 15.01.01, revised November 2018 pdf	https://www.jointcommission.org/measurement/measures/emergency-department/ https://www.jointcommission.org/standards/national-patient-safety-goals/-/media/83ac7352b9ee42c9bda8d70ac2c00ed4.ashx
33	BC Emergency Medicine Network	https://www.bcemergencynetwork.ca/clinical_resource/suicide-risk-assessment/
34	Canadian Mental Health Association Vernon and District Branch	https://cmhavernon.ca/find-help-now/
35	BC Children's Hospital	http://www.bcchildrens.ca/our-services/mental-health-services/psychiatric-emergency
36	Patient Safety Authority Emergency Department Management of the Suicidal Patient	http://patientsafety.pa.gov/ADVISORIES/Pages/200512_18.aspx
37	Action Alliance Recommended Standard Care for People with Suicide Risk:	https://theactionalliance.org/ https://theactionalliance.org/sites/default/files/action_alliance_recommended_standard_care_final.pdf
38	Healthy Salt Lake Emergency Room Intervention for Suicidal Adolescent Females	http://www.healthysaltlake.org/promisepractice/index/view?pid=30123

#	Website name/organization	Link
	Date searched: September 4, 2020	
39	S.A.F.E Alternatives Self-Abuse Finally Ends Emergency Room Staff pdf	https://selfinjury.com/resources/interventions/erstaff/
40	National Suicide Research Foundation Accident & Emergency Nursing Assessment of Deliberate Self Harm pdf	http://www.hc-sc.gc.ca/index-eng.php https://www.nsrf.ie/wp-content/uploads/reports/A+E_DSH.pdf
41	NICE Guideline Managing self-harm in emergency departments	https://pathways.nice.org.uk/ https://pathways.nice.org.uk/pathways/self-harm/managing-self-harm-in-emergency-departments
42	EM Docs Emergency Department Tips & Tricks for Managing the Suicidal Patient	http://www.emdocs.net/emergency-department-tips-tricks-managing-suicidal-patient/
43	Emergency Nurses Association Clinical Practice Guideline: Suicide Risk Assessment Full Version	https://www.ena.org/ http://www.antoniocasella.eu/salute/ENA_suicide_dec12.pdf
44	Crisis Services Canada	https://www.crisisservicescanada.ca/en/
45	SickKids	http://www.sickkids.ca/search/search.aspx?activePillar=hospital
46	Registered Nurses' Association of Ontario Assessment and Care of Adults at Risk for Suicidal Ideation and Behaviour pdf	https://rnao.ca/ https://rnao.ca/bpg/guidelines/assessment-and-care-adults-risk-suicidal-ideation-and-behaviour
47	International Association for Suicide Prevention (IASP)	https://www.iasp.info/resources/Emergency_Medicine_and_Suicidal_Behavior/
48	Mental Health Commission Canada	https://www.mentalhealthcommission.ca/English

#	Website name/organization	Link
	Suicide Prevention Toolkits	https://www.mentalhealthcommission.ca/English/resources/toolkit/suicide-prevention-toolkits
49	The Tennessee Department of Mental Health & Substance Abuse Services	https://www.tn.gov/behavioral-health.html
	Training: Suicide Prevention in the Emergency Department	https://www.tn.gov/behavioral-health/for-providers/training/crisis-services-and-suicide-prevention-training/training-suicide-prevention-in-the-emergency-department.html
50	Center for Addictions and Mental Health	https://www.camh.ca/en/health-info/mental-illness-and-addiction-index/suicide
51	A Victoria state of government	https://www2.health.vic.gov.au/
	Suicide - Working with the suicidal person: Clinical practice guidelines for emergency departments and mental health services pdf	https://www2.health.vic.gov.au/about/publications/policiesandguidelines/suicide-guidelines-working-with-suicidal-person
	Working with the suicidal person pdf	https://www2.health.vic.gov.au/~/media/Health/Files/Collections/Policies%20and%20guidelines/Q/quickref-amh
52	The Ohio Chapter, American College of Emergency Physicians (Ohio ACEP)	https://www.ohacep.org/aws/OACEP/pt/sp/resources_suicide
53	Canadian Mental Health Association Peel Dufferin Branch	https://cmhapeeldufferin.ca/
54	St. Joseph Health care	
	Screening for Suicidality in the Emergency Department	https://www.omne.org/wp-content/uploads/2016/12/Abstract-Presentation-1130am-K.Holst_.pdf
55	CALL TO ACTION Suicide Prevention And Intervention in the Emergency Department (ED)	https://www.icsi.org/wp-content/uploads/2019/07/Suicide-

#	Website name/organization	Link
		Prevention-in-EDs-Call-to-Action-FINAL-V3_072419.pdf
56	National Institute of Mental Health Ask Suicide-Screening Questions (ASQ) Toolkit	https://www.nimh.nih.gov/index.shtml https://www.nimh.nih.gov/research/research-conducted-at-nimh/asq-toolkit-materials/index.shtml
57	The Virginia Department of Health A Guide for Medical Providers in the Emergency Department Taking Care of Suicide Attempt Survivors	https://www.vdh.virginia.gov/suicide-prevention/health-care-providers/ https://www.vdh.virginia.gov/content/uploads/sites/53/2016/11/After-an-Attempt-Brochure_Medical.pdf
58	The Columbia Lighthouse Project	https://cssrs.columbia.edu/the-columbia-scale-c-ssrs/healthcare/
59	Practice guidelines for the management of suicide attempts and suicidal ideation presenting in Emergency Department	https://www.researchgate.net/publication/336922813_Practice_guidelines_for_the_management_of_suicide_attempts_and_suicidal_ideation_presenting_in_Emergency_Department
60	The Royal College of Medicine Mental Health in Emergency Departments A Toolkit for Improving Care	https://www.rcem.ac.uk/ https://www.rcem.ac.uk/docs/RCEM%20Guidance/CEM6883-Mental%20Health%20in%20ED_Toolkit.pdf
61	HSE Our Health Service National Clinical Programme For the Assessment and Management of Patients Presenting to Emergency Departments following Self-Harm pdf	https://www.hse.ie/eng/ https://www.drugsandalcohol.ie/25314/1/nationalclinicalprogselfharm.pdf
62	The New Zealand Ministry of Health New Zealand Guidance Group Emergency department self-harm presentations pdf	http://news.exec.gov.nt.ca/ https://www.moh.govt.nz/notebook/nbbooks.nsf/0/61A269A605B1FE36CC257A4F000EAF72/$file/NZGG-emergency-department-self-harm-presentations.pdf

#	Website name/organization	Link
63	St. Joseph's Healthcare Hamilton Suicide Prevention Work Plan for Implementation of External Review Recommendations	https://www.stjoes.ca/suicidepreventio n/suicide-prevention-external-recommendations-implementation-working-plan-update-march-2018-final.pdf
64	NSW Health	https://www.health.nsw.gov.au/Pages/d efault.aspx
	Suicide Risk Assessment and Management Emergency Department pdf	https://www.health.nsw.gov.au/mentalh ealth/resources/Publications/emergency -dept.pdf
65	Lenus The Irish Health Repository	https://www.lenus.ie/
	Management of Self Harm Presentations to Emergency Department Clinical Programme: Standard Operating Procedure pdf	https://www.lenus.ie/handle/10147/621 259

APPENDIX 4. DATA EXTRACTION TOOL

Reviewer initial:	Date:
Title	
Year of publication	
Authors	
Study objective	
Literature type (e.g., primary study, conference proceedings, report)	
Study type	
Methodology/methods	
Study sample characteristics (i.e., physicians or nurses, or other type of health care	
Country of origin	
Emergency department type (i.e., pediatric or adult)	
Geographical setting (i.e., urban, suburban, or rural)	
Reported use of a theory or framework for the design of intervention	
Definitions used in the study to describe SRTB	
Description of Intervention(s)	
Intervention target(s) (record primary and secondary target when appropriate)	
Reported implementation strategy	
Outcomes measures (i.e., described outcomes and/or measurement tools	
Direction of effect (indicate positive or negative)	
Study implications and recommendations	
Study main findings and conclusion	
Notes	

APPENDIX 5. CODING SCHEMES

Bolded was used for coding

Suicide Prevention Interventions in Emergency Department	
Type	Example
Screening and Assessment	Screening tools Risk assessment tools
Emergency Department-based brief Interventions	Safety planning interventions Lethal means counselling
Disposition Decision and Discharge Planning	Referrals Psychiatry admission Follow-up
Empathetic Care and Therapeutic Relationship	Communication skills
Clinical management re. suicide prevention	Risk management in ED in the presence of patient with SRTB Documentation General management

BCW Nine Intervention Functions (Michie et al ., 2011, 2014)	
Type (Definition)	Example
Education (Increasing knowledge or understanding)	Providing information to promote healthy eating
Persuasion (An ability or proficiency acquired through practice)	Using imagery to motivate increases in physical activity
Incentivization (Creating expectation of reward)	Using prize draws to induce attempts to stop smoking
Coercion (Creating expectation of punishment or cost)	Raising the financial cost to reduce excessive alcohol consumption
Training (Imparting skills)	Advanced driver training to increase safe driving
Restriction (Using rules to reduce the opportunity to engage in the target behaviour or to increase the target behaviour by reducing	Prohibiting sales of solvents to people under 18 to reduce use for intoxication

BCW Nine Intervention Functions (Michie et al ., 2011, 2014)	
the opportunity to engage in competing behaviours)	
Environmental restructuring (Changing the physical or social context)	Providing on-screen prompts for GPs to ask about smoking behaviour
Modelling (Providing an example for people to aspire to or imitate)	Using TV drama scenes involving safe-sex practices to increase condom use
Enablement (Increasing means/reducing barriers to increase capability or opportunity) Capability beyond education and training; opportunity beyond environmental restructuring	Behavioral support for smoking cessation, medication for cognitive deficits, surgery to reduce obesity, prostheses to promote physical activity

Outcome Measures (R E Glasgow et al., 1999; E. Proctor et al., 2011; Reilly et al., 2020)			
Dimension (Definition)			Example
Reach (the absolute number, proportion, and representativeness of individuals who are willing to participate in a given initiative)			• Participation rate • Response rate • Attendance rate
Effectiveness (the impact of an intervention on outcomes, including potential negative effects, quality of life, and economic outcomes)	**Clinician level**	**Conceptual knowledge use** (proximal behaviour change)	• Knowledge • Attitude • Self-efficacy
		Instrumental knowledge use (observable behaviour change)	• Rates of referrals • Rates of completed assessments • Adherence to practice guideline
	Patient level	**Patient reported outcome measure** (PROM)	• Symptoms • Function • Quality of life
		Patient reported experience measure (PREM)	• Patient satisfaction
		Patient outcomes	• Mortality • Morbidity

<table>
<tr><td colspan="4">Outcome Measures
(R E Glasgow et al., 1999; E. Proctor et al., 2011; Reilly et al., 2020)</td></tr>
<tr><td colspan="3">Dimension (Definition)</td><td>Example</td></tr>
<tr><td rowspan="2"></td><td></td><td></td><td>• Physiological measures</td></tr>
<tr><td>Organization</td><td>Resource utilization, coverage, access, use</td><td>• Admission rates
• Length of stay
• Waiting times to see a doctor
• Cost analysis</td></tr>
<tr><td colspan="3">Adoption

(the absolute number, proportion, and representativeness of settings and intervention staff willing to initiate a program or policy in their setting)</td><td>• Acceptability (organizational staff satisfaction with intervention, as antecedent to adoption)</td></tr>
<tr><td colspan="3">Implementation

(the intervention agents' fidelity to the various elements of an intervention's protocol)</td><td>• Adaptation
• Fidelity
• Feasibility (antecedent to implementation)</td></tr>
<tr><td colspan="3">Maintenance

(the extent to which a program or policy becomes institutionalized or part of the routine organizational practices and policies)</td><td>• Sustainability</td></tr>
</table>

Conceptual knowledge use: changes in understanding, attitudes, or intentions. Graham, Bick, Tetroe, Straus, & Harrison, 2010)

Instrumental knowledge use: the concrete application of knowledge in practice that should result in a desired outcome. Graham, Bick, Tetroe, Straus, & Harrison, 2010)

Resource utilization, coverage, access:
Utilisation of services, e.g. of birthing facilities; length of stay in a facility
Coverage, e.g. proportion of children immunized or women who received antenatal care; enrolment to insurance programmes
Access to services, e.g. waiting times to see a doctor; recruitment and retention of health care providers
(Cochrane Effective Practice and Organisation of Care (EPOC)., 2017)

Resource use:
Healthcare resources, e.g. human resources/time, consumable supplies, buildings, equipment
Non-healthcare resources, e.g. transportation to healthcare facilities, social services

Patient and informal caregiver time
(Cochrane Effective Practice and Organisation of Care (EPOC)., 2017)

Patient-reported outcomes (PROs): A PRO is directly reported by the patient without interpretation of the patient's response by a clinician or anyone else and pertains to the patient's health, quality of life, or functional status associated with health care or treatment (FDA, 2009)

Patient-reported experience measures (PREMs) are tools and instruments that report patient satisfaction scores with a health service and are generic tools that are often used to capture the overall patient experience of health care.
(Kingsley & Patel, 2017)

Patient outcomes:
Health status and wellbeing, including:
Physical health and treatment outcomes: mortality, morbidity, surrogate physiological measures
Psychological health: psychological well being
Psychosocial outcomes: quality of life, social activities
Health behaviour, e.g. adherence to treatment or care plans, health care seeking behaviour
(Cochrane Effective Practice and Organisation of Care (EPOC)., 2017)

APPENDIX 6: EXCLUDED CITATIONS WITH REASONS (RESULTS FROM DATABASE SEARCH)

Title	Authors	Year	Reasons for exclusion
Enhanced "Train and Hope" for Scalable, Cost-Effective Professional Development in Youth Suicide Prevention.	Adrian, Molly; Lyon, Aaron R; Nicodimos, Semret; Pullmann, Michael D; McCauley, Elizabeth	2017	Wrong population
Can E-mail reminders sustain training gains from continuing education?	Adrian, Molly; Lyon, Aaron R.	2016	Wrong population
Enhanced 'train and hope' for scalable, cost-effective professional development in youth suicide prevention	Adrian, Molly; Lyon, Aaron R.; Nicodimos, Semret; Pullmann, Michael D.; McCauley, Elizabeth	2018	Wrong population
Emergency department initiation of levetiracetam for seizure: A cohort study examining psychiatric risk assessment and counseling	Afazal U.; Oostema J.A.; Smith B.	2013	Wrong topic
Preventing self-harm and reducing suicidal ideation through an expedited regular supportive psychotherapy and assertive case management-protocol for a three-arm partial randomised controlled trial	Agyapong V.; Behre T.; Juhas M.; Greenshaw A.	2016	Wrong study design
ED-based Universal Screening Helps Identify Patients at Risk for Suicide.	AHC MEDIA	2018	No intervention/ No description of intervention
Emergency Providers Play a Pivotal Role in Suicide Prevention.	AHC MEDIA	2018	No intervention/ No description of intervention
More Pediatric Patients Visiting ED for Mental Health-Related Reasons.	AHC MEDIA	2020	No intervention/ No description of intervention
Linking suicide attempt patients with community support programs: The effect of a crisis intervention team operating in the emergency department	Ahn E.; Moon S.; Kim J.; Jun S.; Yoon S.; Ko Y.-H.; Cho H.; Song J.	2016	Wrong population
Psychiatric consultations in the emergency room.	Albornoz-Ruiz JM	1972	Intervention not implemented
Suicidal individuals and mental health treatment: A novel approach to engagement	Alonzo, Dana	2016	Wrong population
A novel intervention for treatment of suicidal individuals	Alonzo, Dana; Stanley, Barbara	2013	No intervention/ No description of intervention
What Every ED Nurse Should Know About Suicide Risk Assessment	Antai-Otong D.	2016	Intervention not implemented
Management of the Depressed, Suicidal Child or Adolescent	Apter A.; King R.A.	2006	No intervention/ No description of intervention

Title	Authors	Year	Reasons for exclusion
Implementation and use of a crisis hotline during the treatment as usual and universal screening phases of a suicide intervention study	Arias S.A.; Sullivan A.F.; Miller I.; Camargo C.A.; Boudreaux E.D.	2015	Intervention does not target professional behaviour change
Using structured telephone follow-up assessments to improve suicide-related adverse event detection	Arias, Sarah A.; Zhang, Zi; Hillerns, Carla; Sullivan, Ashley F.; Boudreaux, Edwin D.; Miller, Ivan; Camargo, Carlos A.	2014	Wrong population
Short Personality and Life Event scale for detection of suicide attempters.	Artieda-Urrutia P; Delgado-Gómez D; Ruiz-Hernández D; García-Vega JM; Berenguer N; Oquendo MA; Blasco-Fontecilla H	2015	Wrong population
Suicide attempt risk in youths: utility of the Harkavy-Asnis suicide scale for monitoring risk levels.	Asarnow J; McArthur D; Hughes J; Barbery V; Berk M	2012	Wrong population
An emergency department intervention for linking pediatric suicidal patients to follow-up mental health treatment	Asarnow, Joan Rosenbaum; Baraff, Larry J.; Berk, Michele; Grob, Charles S.; Devich-Navarro, Mona; Suddath, Robert; Piacentini, John C.; Rotheram-Borus, Mary Jane; Cohen, Daniel; Tang, Lingqi	2011	Wrong population
The use of a mental health triage assessment tool in a busy Canadian tertiary care children's hospital.	Ayliffe L; Lagace C; Muldoon P	2005	Wrong topic
Emergency Department Screening for Suicide and Mental Health Risk	Babeva K.; Hughes J.L.; Asarnow J.	2016	Wrong study design
Youth Suicide Attempt Nomenclature Used in Two Central Texas Hospitals	Barczyk A.N.; Piper K.; Duzinski S.V.; Klingensmith M.; Lawson K.A.	2018	Wrong population
Psychosocial assessment of patients who attend an accident and emergency department with self-harm	Barr, W.; Leitner, M.; Thomas, J.	2005	Wrong population
Headss up: Should all adolescents be screened in the emergency department	Begley R.; Roberts Z.; Mullen S.	2019	No intervention/ No description of intervention
Implementation of an opioid detoxification management pathway reduces emergency department length of stay	Bellew S.D.; Collins S.P.; Barrett T.W.; Russ S.; Jones I.; Self W.H.	2017	Wrong topic
General practice based intervention to prevent repeat episodes of deliberate self harm: Cluster randomised controlled trial	Bennewith O.; Stocks N.; Gunnell D.; Peters T.J.; Evans M.O.; Sharp D.J.	2002	Wrong population

Title	Authors	Year	Reasons for exclusion
Lethal means restriction for suicide prevention: Change in provider beliefs and behaviors during ED process improvement	Betz M.E.; Ting S.; Espinola J.A.; Miller M.; Barber C.; Camargo Jr. C.A.; Miller I.; Boudreaux E.D.	2014	No intervention/ No description of intervention
Managing Suicidal Patients in the Emergency Department.	Betz ME; Boudreaux ED	2016	No intervention/ No description of intervention
Computerized screening for major depressive disorder and suicide risk in an emergency department	Biddle E.; Davis S.M.; Layman S.M.; Khafaji S.	2016	Wrong population
Non-psychiatric nurses' perceived self-efficacy after an educational intervention on suicide prevention and care	Blair, Ellen W.; Chhabra, Jyoti; Belonick, Cynthia; Tackett, Maria	2018	Wrong population
Suicide: Guidelines for assessment, management, and treatment	Bongar, Bruce Michael	1992	Wrong information source
The emergency department safety assessment and follow-up evaluation (ED-SAFE): The effect of implementing universal suicide risk screening	Boudreaux E.D.; Arias S.A.; Sullivan A.F.; Allen M.H.; Goldstein A.; Manton A.; Espinola J.A.; Camargo Jr. C.A.; Miller I.	2014	Abstract, full text included
Universal suicide screening in emergency departments: Examining clinician fidelity by interviewing patients	Boudreaux E.D.; Larkin C.; Johnson S.; Pelletier L.; Morena A.; Stanley B.	2018	Wrong topic
First-year follow-up of the Psychiatric Emergency Response Team (PAM) in Stockholm County, Sweden: A descriptive study	Bouveng, Olof; Bengtsson, Fredrik A.; Carlborg, Andreas	2017	Wrong population
Special Series on the Use of Technology in the Delivery of Child and Youth Mental Health Services and Supports.	Boydell, Katherine M.; Pignatiello, Antonio	2016	No intervention/ No description of intervention
Assessing the feasibility of a universal suicide screen in a non-psychiatric emergency department	Brady S.	2010	Wrong population
Implementing youth suicide risk screening and intervention in pediatric inpatient, outpatient, and emergency room settings: evidence from across the united states	Brahmbhatt K.	2019	No intervention/ No description of intervention
71.1 A Clinical Pathway: Identification, Assessment, and Management in Suicide Risk Screening	Brahmbhatt K.	2018	Wrong information source
Behavioural assessment unit improves outcomes for patients with complex psychosocial needs	Braitberg G.; Gerdtz M.; Harding S.; Pincus S.; Thompson M.; Knott J.	2018	Wrong topic
Developing, implementing and evaluating a model for an outpatient self-harm service	Brand F.; Lascelles K.	2017	Wrong population

Title	Authors	Year	Reasons for exclusion
Familial pathways to suicidal behavior - Understanding and preventing suicide among adolescents	Brent D.A.; Mann J.J.	2006	No intervention/ No description of intervention
ED-SAFE-can suicide risk screening and brief intervention initiated in the emergency department save lives?	Bridge J.A.; Horowitz L.M.; Campo J.V.	2017	Wrong information source
Mitigating Nursing Biases in Management of Intoxicated and Suicidal Patients.	Brosinski C; Riddell A	2015	No intervention/ No description of intervention
Minding and caring in the emergency department -- Emergency nurses caring for patients who have self-poisoned...Mind to Care -- 35th International Mental Health Nursing Conference of the Australian College of Mental Health Nurses, 29 September - 2 October	Bryant J		No intervention/ No description of intervention
Violent behavior of patients admitted in emergency following drug suicidal attempt: A specific staff educational crisis intervention	Cailhol, Lionel; Allen, Michael; Moncany, Anne-Hélène; Cicotti, Andrei; Virgillito, Salvatore; Barbe, Rémy P.; Lazignac, Coralie; Damsa, Cristian	2007	Wrong topic
Emergency care staff receive guidance on suicide prevention.	Callanan C.	2012	No intervention/ No description of intervention
A&E staff need training in care of people who self-harm.	Callanan, Charlie	2012	Wrong information source
ER visits reveal chance to screen preteens for suicide risk.	Canady, Valerie A.	2019	Intervention does not target professional behaviour change
The HEADS-ED: Evaluating the Clinical Use of a Brief, Action-Oriented, Pediatric Mental Health Screening Tool	Cappelli M.; Zemek R.; Polihronis C.; Thibedeau N.R.; Kennedy A.; Gray C.; Jabbour M.; Reid S.; Cloutier P.	2020	Wrong topic
The HEADS-ED: Review of a Mental Health Screening Tool for Pédiatric Patients in the Emergency Department.	Cappelli, Mario	2012	Wrong information source
Abordagem do enfermeiro diante de indicadores suicidas.	Cardoso, Anajás Da Silva; Gonzaga, Nathalia Costa; Medeiros, Carla Campos Muniz	2011	Wrong topic
Follow-up interventions after suicide attempt. What tools, what effects and how to assess them?	Castaigne E.; Hardy P.; Mouaffak F.	2017	Wrong language
Implementing an Emergency Department Telephone Follow-Up Program for Suicidal Patients: Successes and Challenges	Catanach B.; Betz M.E.; Tvrdy C.; Skelding C.; Brummett S.; Allen M.H.	2019	Wrong population

Title	Authors	Year	Reasons for exclusion
Telephone management program for patients discharged from an emergency department after a suicide attempt: A 5-year follow-up study in a Spanish population	Cebria, Ana Isabel; Pérez-Bonaventura, Iris; Cuijpers, Pim; Kerkhof, Ad; Parra, Isabel; Escayola, Anna; García-Parés, Gemma; Oliva, Joan Carles; Puntí, Joaquim; López, David; Valles, Vicenç; Pamias, Montserrat; Hegerl, Ulrich; Pérez-Sola, Victor; Palao, Diego J.	2015	Intervention does not target professional behaviour change
Association of PHQ-9, C-SSRS and clinican clinical impression with subsequent clinical course in suicidal patients in the ED	Chang B.P.; Mollah T.; Park J.	2015	Intervention not implemented
4.40 Evaluation of a Family Intervention for Suicide Prevention (FISP) for Suicidal Youth in Acute Care Medical Settings	Chapman M.R.; Miles J.J.; Nizami S.S.; Hutcherson K.	2018	No intervention/ No description of intervention
Screening for substance use, suicide risk, and safety in two south african emergency departments	Chen V.H.; Hansoti B.; Rao A.; Mda P.; Parrish A.; Quinn T.C.	2018	Wrong topic
Demand and characteristics of a psychiatric 24-hour emergency service performed by mandatory rotation of licensed psychiatrists in Swiss primary care.	Chmiel C; Rosemann T; Senn O	2014	Wrong topic
Emergency Department Screening for Adolescent Mental Health Disorders: The Who, What, When, Where, Why, and How It Could and Should Be Done	Chun T.H.; Duffy S.J.; Linakis J.G.	2013	Wrong information source
The daps tool: An actionable screen for psychiatric risk factors for rehospitalization	Coffey C.; Johns J.; Orozco Z.; Veliz S.; Coffey M.J.	2012	Wrong topic
Implementation of a “4-phone-calls-over-1-year” program for adolescent suicide attempters after discharge from ER: Lessons learned from Avicenne Hospital adolescent consultation-liaison outpatient unit	Colin S.; Normand D.; Gaboulaud V.; Benoit De Coignac A.; Moro M.R.; Baubet T.; Taieb O.	2012	Wrong population
Interacting with the mental health crisis victim.	Concialdi, Matt	2017	No intervention/ No description of intervention
Novel Use of Natural Language Processing (NLP) to Predict Suicidal Ideation and Psychiatric Symptoms in a Text-Based Mental Health Intervention in Madrid	Cook B.L.; Progovac A.M.; Chen P.; Mullin B.; Hou S.; Baca-Garcia E.	2016	Wrong population
Taking a holistic approach to acute mental health crisis.	Cook, Amy	2019	Wrong information source

Title	Authors	Year	Reasons for exclusion
The effect of referral for brief intervention for alcohol misuse on repetition of deliberate self-harm: An exploratory randomized controlled trial	Crawford, M. J.; Csipke, E.; Brown, A.; Reid, S.; Nilsen, K.; Redhead, J.; Touquet, R.	2010	Intervention does not target professional behaviour change
A clash of cultures: A&E and mental health.	Crowley J.J.	2000	Wrong topic
A suicide awareness and intervention program for health professional students	De Silva, Eve; Bowerman, Lisa; Zimitat, Craig	2015	Wrong population
Modeling the cost-effectiveness of interventions to reduce suicide risk among hospital emergency department patients	Denchev, Peter; Pearson, Jane L.; Allen, Michael H.; Claassen, Cynthia A.; Currier, Glenn W.; Zatzick, Douglas F.; Schoenbaum, Michael	2018	Wrong study design
Suicide risk assessment in hospitals: An expert system-based triage tool	Desjardins I.; Cats-Baril W.; Maruti S.; Freeman K.; Althoff R.	2016	Intervention not implemented
Children who harm themselves: Development of a paediatric emergency department triage tool	Dieppe C.; Stanhope B.; Rakhra K.	2009	Intervention not implemented
Lethal means assessment and counseling in the emergency department: Differences by provider type and personal home firearms	Diurba, Sofiya; Johnson, Rachel L.; Siry, Bonnie J.; Knoepke, Christopher E.; Suresh, Krithika; Simpson, Scott A.; Azrael, Deborah; Ranney, Megan L.; Wintemute, Garen J; Betz, Marian E.	2020	No intervention/ No description of intervention
Preventing suicide minute by minute	Draper J.	2007	Wrong information source
Helping callers to the National Suicide Prevention Lifeline who are at imminent risk of suicide: The importance of active engagement, active rescue, and collaboration between crisis and emergency services	Draper, John; Murphy, Gillian; Vega, Eduardo; Covington, David W.; McKeon, Richard	2015	Wrong study design
3.51 Identification of At-Risk Pre-Adolescents Through Suicide Screening in Pediatric Emergency Departments.	Edwards, Sarah; Cwik, Mary; Jay, Samantha Y.; Wilson, Mary Ellen; Baddoura, Karen; Hoover, Sharon; Virden, Jane; Goldstein, Mitchell; Wilcox, Holly	2017	Wrong population
Sustaining evidence-based practice for young people who self-harm: a 4-year follow-up	Einfeld S.; Tobin M.; Beard J.; Evans E.; Dudley M.	2004	Outcomes not separable for ED specific participants
Code-51: Keeping suicidal veterans safe in the emergency department	Eisenzimmer, Rhonda K.	2012	Intervention not implemented
Improving the skills of rural and remote generalists to manage mental health emergencies.	Ellis I.K.; Philip T.	2010	Wrong population

Title	Authors	Year	Reasons for exclusion
Emergency psychology: a mobile service for police crisis calls	Everstine D.S.; Bodin A.M.; Everstine L.	1977	Wrong population
Effect of telephone follow-up on repeated suicide attempt in patients discharged from an emergency psychiatry department: A controlled study	Exbrayat, Sophie; Coudrot, Clotilde; Gourdon, Xavier; Gay, Aurélia; Sevos, Jessica; Pellet, Jacques; Trombert-Paviot, Béatrice; Massoubre, Catherine	2017	Wrong population
Consultations in emergency medicine: suicidal patients in the emergency department.	Fauman B	1981	Wrong information source
Feasibility and effects of a web-based adolescent psychiatric assessment administered by clinical staff in the Pediatric Emergency Department	Fein J.A.; Pailler M.E.; Barg F.K.; Wintersteen M.B.; Hayes K.; Tien A.Y.; Diamond G.S.	2010	Wrong topic
Screening tools in the emergency department	Feuer V.; Goldston D.B.	2019	No intervention/ No description of intervention
Effectiveness of brief intervention and contact for suicide attempters: A randomized controlled trial in five countries	Fleischmann A.; Bertolote J.M.; Wasserman D.; De Leo D.; Bolhari J.; Botega N.J.; De Silva D.; Phillips M.; Vijayakumar L.; Värnik A.; Schlebusch L.; Thanh H.T.T.	2008	Wrong population
Detecting suicide risk in adolescents and adults in an emergency department: A pilot study	Folse, Victoria N.; Eich, Katie N.; Hall, Amy M.; Ruppman, Joan B.	2006	Intervention does not target professional behaviour change
Suicide risk screening in an emergency department: Engaging staff nurses in continued testing of a brief instrument	Folse, Victoria N.; Hahn, Rebecca L.	2009	Wrong outcomes
Suicide awareness and prevention training in a high security setting.	Fry, James	2012	Wrong population
Effectiveness of assertive case management on repeat self-harm in patients admitted for suicide attempt: Findings from ACTION-J study	Furuno, Taku; Nakagawa, Makiko; Hino, Kosuke; Yamada, Tomoki; Kawashima, Yoshitaka; Matsuoka, Yutaka; Shirakawa, Osamu; Ishizuka, Naoki; Yonemoto, Naohiro; Kawanishi, Chiaki; Hirayasu, Yoshio	2018	Wrong outcomes
Improving the design of the assessment of emergency department patients at risk for self-harm.	Gaddis GM	2006	No intervention/ No description of intervention
How comprehensive is suicide risk assessment in the emergency department?	Gale C.; Glue P.	2018	No intervention/ No description of intervention
68.2 Suicide risk intervention in pediatric emergency rooms: evidence from implementation in utah	Giles L.L.	2019	Intervention does not target professional behaviour change

Title	Authors	Year	Reasons for exclusion
4.2 Utilizing a trauma-informed therapeutic intervention in the emergency department for risk assessment	Giles L.L.	2019	Wrong population
A study of patients referred following an episode of self-harm, a suicide attempt, or in a suicidal crisis using routinely collected data	Gkaravella, Antigoni	2014	No intervention/ No description of intervention
A Stepwise Approach to Ethically Assess Pragmatic Cluster Randomized Trials: Implications for Informed Consent for Suicide Prevention Implementation Research.	Goldstein, Cory E.; Weijer, Charles	2019	Wrong topic
4.4 The heads-ed: a psychosocial screening tool for the emergency department and beyond	Gray C.	2019	Wrong topic
Improvement in the management of acutely poisoned patients using an electronic database, prospective audit and targeted educational intervention	Greene S.L.; Wood D.M.; Gawarammana I.B.; Warren-Gash C.; Drake N.; Jones A.L.; Dargan P.I.	2008	Wrong topic
Acute hospital reconfiguration and self-harm presentations: a before-and-after study	Griffin E.; Murphy C.; Perry I.J.; Lynch B.; Arensman E.; Corcoran P.	2019	Wrong topic
Structured follow-up by general practitioners after deliberate self-poisoning: A randomised controlled trial	Grimholt, T. K.; Jacobsen, D.; Haavet, O. R.; Sandvik, L.; Jorgensen, T.; Norheim, A. B.; Ekeberg, O.	2015	Wrong population
Delivery of clinical social work services in the emergency room: A description of an existing program	Groner E.	1978	No intervention/ No description of intervention
A randomized controlled trial to engage in care of adolescent emergency department patients with mental health problems that increase suicide risk	Grupp-Phelan J.; McGuire L.; Husky M.M.; Olfson M.	2012	Intervention does not target professional behaviour change
Routine use of the Beck Scale for Suicide Ideation in a psychiatric emergency department	Healy, Daniel J.; Barry, Kris; Blow, Frederic; Welsh, Deborah; Milner, Karen K.	2006	Intervention does not target professional behaviour change
What Is “High Risk” and What Are We Actually Supposed to Do About It?	Henderson S.W.; Gerson R.; Phillips B.	2019	Intervention not implemented
Prevention over prediction: the psychiatrist challenge of suicide risk assessment in the emergency department	Hernández-Calle D.; Martínez-Alés G.; Román-Mazuecos E.; Rodríguez-Vega B.; Bravo-Ortiz M.F.	2020	Wrong language
Screening to identify groups of pediatric emergency department patients using latent class analysis of reported suicidal ideation and behavior and non-suicidal self-injury	Herres, Joanna; Kodish, Tamar; Fein, Joel; Diamond, Guy	2018	Wrong population

Title	Authors	Year	Reasons for exclusion
A&E nurse training may prove key in detecting high-risk suicide patients.	Hitchen L		No intervention/ No description of intervention
Developing A&E nursing responses to people who deliberately self-harm: The provision and evaluation of a series of reflective workshops	Holdsworth, N.; Belshaw, D.; Murray, S.	2001	Outcomes not separable for ED specific participants
Trial of an intervention to reduce suicidal ideation and behaviour	House A.; Owens D.	2016	Wrong information source
Coordination between medical care providers and information technology resources in the management of patients with suicide attempts attending the emergency department	Huang H.-H.; Fan J.-S.; Chen Y.-C.; Yen D.H.T.	2014	No intervention/ No description of intervention
Enhanced Mental Health Interventions in the Emergency Department: Suicide and Suicide Attempt Prevention	Hughes J.L.; Asarnow J.R.	2013	Wrong population
A comparison in hospitalization rates between a community-based mobile emergency service and a hospital-based emergency service.	Hugo M; Smout M; Bannister J	2002	Wrong topic
Effectiveness of an informational booklet on care of attempted suicide patients.	Jincy, J; Linu, S Q; Binil, V	2011	Outcomes not separable for ED specific participants
Self-Inflicted Injury-Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP-SI): a new surveillance tool for detecting self-inflicted injury events in emergency departments	Johnson D.; Skinner R.; Cappelli M.; Zemek R.; McFaull S.; Langill C.; Cloutier P.	2019	Wrong population
An emergency department intervention to protect an overlooked group of children at risk of significant harm	Kaye P.; Taylor C.; Barley K.; Powell-Chandler A.	2009	Wrong topic
Can education change nursing attitudes of Japanese nursing personnel toward patients who have attempted suicide?	Kishi Y.	2012	No intervention/ No description of intervention
An emergency department-based brief intervention for veterans at risk for suicide (SAFE VET).	Knox K.L.; Stanley B.; Currier G.W.; Brenner L.; Ghahramanlou-Holloway M.; Brown G.	2012	Intervention does not target professional behaviour change
Solution-focused therapy in an emergency room setting: Increasing hope in persons presenting with suicidal ideation	Kondrat, David C.; Teater, Barbra	2012	Intervention not implemented

Title	Authors	Year	Reasons for exclusion
Virtual monitoring of suicide risk in the general hospital and emergency department	Kroll D.S.; Stanghellini E.; DesRoches S.L.; Lydon C.; Webster A.; O'Reilly M.; Hurwitz S.; Aylward P.M.; Cartright J.A.; McGrath E.J.; Delaporta L.; Meyer A.T.; Kristan M.S.; Falaro L.J.; Murphy C.; Karno J.; Pallin D.J.; Schaffer A.; Shah S.B.; Lakatos B.E.; Mitchell M.T.; Murphy C.A.; Gorman J.M.; Gitlin D.F.; Mulloy D.F.	2020	Wrong population
Depression and the Suicidal Patient.	Kuo DC; Tran M; Shah AA; Matorin A	2015	Wrong information source
Psychiatric emergencies call for comprehensive assessment and treatment.	Lamberg, Lynne	2002	Wrong information source
Nursing students attitudes across the suicidal behavior.	Lappann Botti, Nadja Cristiane; Costa de Araújo, Leandro Martins; Costa, Elbert Eddy; de Almeida Machado, Jacqueline Simone	2015	Wrong population
TXT Rx: Using health information technology to safely discharge suicidal patients from the emergency department	Larkin G.; Beautrais A.; Meredith T.; Tabakakis K.	2009	Wrong population
Calculated Decisions: ED-SAFE Patient Safety Screener (PSS-3)	Lee H.	2019	Intervention does not target professional behaviour change
Psychiatric nursing emergency: A simulated experience of a wrist-cutting suicide attempt	Lilly, Mary L.; Hermanns, Melinda S.; Crawley, Bill	2012	Wrong population
Specialists in A & E. Holistic care in parasuicide.	Lindars J	1991	No intervention/ No description of intervention
Commentary on substance use disorders and risk of suicide in a general US population: a case control study by Lynch et al.	Little V; James MC	2020	Wrong information source
4.50 Training Module for Resident Physicians on Use of Suicide Risk Assessment for Children and Adolescents Checklist (SRACC) to Improve Competency in Adolescent Suicide Risk Evaluation	Lokhande A.P.; Deshpande S.; Ekambaram V.	2018	Wrong population
RCT evaluating provider outcomes by suicide prevention training modality: in-person vs. e-learning.	Magruder, Kathryn Marley; York, Janet Ann; Knapp, Rebecca G.; Yeager, Derik Edward;	2015	Wrong population

Title	Authors	Year	Reasons for exclusion
	Marshall, Elizabeth; DeSantis, Mark		
Does targeted education of emergency physicians improve their comfort level in treating psychiatric patients?	Marciano R.; Mullis D.M.; Jauch E.C.; Carr C.M.; Raney L.; Martin R.H.; Walker B.J.; Saef S.H.	2012	Wrong topic
An emergency department-initiated intervention to lower relapse risk after attempted suicide	Martínez-Alés, Gonzalo; Jiménez-Sola, Eduardo; Román-Mazuecos, Eva; Sánchez-Castro, María Pilar; Dios, Consuelo; Rodríguez-Vega, Beatriz; Bravo-Ortiz, María Fe	2019	Intervention does not target professional behaviour change
Improving emergency care for youth at risk for suicide	Maslow G.; Inscoe A.B.; Ellis D.T.	2019	Wrong information source
The assessment and management of self-harming patients in an Accident and Emergency department: an action research project.	Mc ELROY, ALASTAIR; SHEPPARD, GERRY	1999	No intervention/ No description of intervention
Parasuicide assessment in the emergency department.	McCauley M; Browne D	2006	Wrong information source
Telephonic Follow Up for Suicidal Patients Discharged from the Emergency Department: Why It Is Crucial.	McKeon, Richard	2019	No intervention/ No description of intervention
Dealing with suicide calls.	Meeham, P J; O'Carroll, P W	1990	Wrong information source
Development of a suicidal ideation detection tool for primary healthcare settings: Using open access online psychosocial data	Meyer, Denny; Abbott, Jo-Anne; Rehm, Imogen; Bhar, Sunil; Barak, Azy; Deng, Gary; Wallace, Klaire; Ogden, Edward; Klein, Britt	2017	Wrong population
Outcome situations of patients, after admission at the emergency room, with suicidal attempt	Minner P.; Lorge D.; Cornet H.; Neu D.; Pelc I.; Verbanck P.	2008	No intervention/ No description of intervention
Preventing adolescent suicide	Moreno M.A.	2016	Wrong information source
Hot Off the Press: Assessing Risk of Future Suicidality in Emergency Department Patients.	Morgenstern, Justin; Heitz, Corey; Bond, Chris; Milne, William K.; Choo, Esther K.	2019	Wrong information source
The effects on suicide rates of an educational intervention for front-line health professionals with suicidal patients (the STORM Project)	Morriss, Richard; Gask, Linda; Webb, Roger; Dixon, Clare; Appleby, Louis	2005	Wrong outcomes
Critical issues in adolescent mental health in the emergency department:	Moukaddam N.; Onigu-Otite E.; Tucci V.	2019	Wrong information source

Title	Authors	Year	Reasons for exclusion
Looking beyond triage and risk assessment			
Emergency Providers Play a Pivotal Role in Suicide Prevention: Train emergency staff how to manage patients at risk for suicide, but beware scarce resources and watch for logistical barriers.	NA	2018	Intervention not implemented
Suicide assessment team in the ED.	NA	2011	No intervention/ No description of intervention
Patient is suicidal? Inform all others.	NA	2011	No intervention/ No description of intervention
Specialized training helps ER nurses better manage children at risk for suicide.	NA	2002	Wrong information source
PSS-3: Three-question suicide screener for the ER.	NA	2018	Wrong information source
Suicide prevention strategy.	NA	2018	Wrong information source
A follow-up report on preventing suicide: focus on medical/surgical units and the emergency department.	NA	2010	Wrong population
Study will focus on suicide prevention in ED.	NA	2011	Wrong study design
Pediatric suicide-related presentations: A systematic review of mental health care in the emergency department	Newton A.S.; Hamm M.P.; Bethell J.; Rhodes A.E.; Bryan C.J.; Tjosvold L.; Ali S.; Logue E.; Manion I.G.	2010	Wrong study design
Psychiatric interventions in the emergency room.	Nichols N.	1978	Wrong information source
Points & Pearls: Depressed and suicidal patients in the emergency department: an evidence-based approach.	Nusbaum J; Gupta N	2019	Wrong information source
A retrospective analysis of boarding times for adolescents in psychiatric crisis.	nusbaum J; Gupta N	2018	Wrong topic
Addressing suicide risk in emergency department patients.	Olfson M; Marcus SC; Bridge JA	2014	Wrong information source
Randomised controlled trial of therapeutic assessment versus usual assessment in adolescents with self-harm: 2-year follow-up	Ougrin D.; Boege I.; Stahl D.; Banarsee R.; Taylor E.	2013	Wrong population
Interventions for self-harm: Are we measuring outcomes in the most appropriate way?	Owens C.	2010	Wrong information source
Computerized behavioral health screening in the emergency department	Pailler M.E.; Fein J.A.	2009	Wrong topic

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Identifying, preventing, and treating suicidal youth	Pao M.; Falcone T.; Jobes D.A.; Horowitz L.M.; Austerman J.M.; Timmons-Mitchell J.	2017	No intervention/ No description of intervention
Development of New Quality Measures for Hospital-Based Care of Suicidal Youth	Parast L.; Bardach N.S.; Burkhart Q.; Richardson L.P.; Murphy J.M.; Gidengil C.A.; Britto M.T.; Elliott M.N.; Mangione-Smith R.	2018	Wrong topic
Cost-effectiveness of a Brief Structured Intervention Program Aimed at Preventing Repeat Suicide Attempts Among Those Who Previously Attempted Suicide: A Secondary Analysis of the ASSIP Randomized Clinical Trial	Park A.-L.; Gysin-Maillart A.; Müller T.J.; Exadaktylos A.; Michel K.	2018	Wrong population
Urgent adolescent psychiatric consultation: from the accident and emergency department to inpatient adolescent psychiatry.	Parker KC; Roberts N; Williams C; Benjamin M; Cripps L; Woogh C	2003	Wrong topic
Suicide Prevention in the Emergency Department	Perhats C.; Valdez A.M.	2008	Intervention not implemented
Barriers and facilitators of suicide risk assessment in an emergency department: Perspectives from health care providers	Petrik, Megan L.	2015	No intervention/ No description of intervention
Psychiatric nurses in the emergency room.	Pisarcik G; Zigmund D; Summerfield R; Mian P; Johansen P; Deveraux P	1979	No intervention/ No description of intervention
Marked reduction in length of stay for patients with psychiatric emergencies after implementation of a comanagement model	Polevoi S.K.; Jewel Shim J.; McCulloch C.E.; Grimes B.; Govindarajan P.	2013	Wrong topic
Improving emergency care for patients who self harm.	Price N	2007	Wrong information source
Advance decisions to refuse treatment and suicidal behaviour in emergency care: 'It's very much a step into the unknown'	Quinlivan L.; Nowland R.; Steeg S.; Cooper J.; Meehan D.; Godfrey J.; Robertson D.; Longson D.; Potokar J.; Davies R.; Allen N.; Huxtable R.; Mackway-Jones K.; Hawton K.; Gunnell D.; Kapur N.	2019	Wrong topic
Management of behaviours of concern in a public hospital setting	Rauchberger I.; Whitecross F.; Symons E.; Hobbs B.; Breadon C.	2019	Wrong topic
Reduction of postdischarge suicidal behavior among adolescents through a telephone-based intervention	Rengasamy, Manivel; Sparks, Garrett	2019	Wrong population

Title	Authors	Year	Reasons for exclusion
ED telephone: a lifeline for potential suicides.	Resnik HL; Sweeney J; Resnik AF	1974	Intervention not implemented
Trauma center-community partnerships to address firearm injury: it can be done.	Richmond T.S.; Branas C.C.; Schwab C.W.	2004	Wrong topic
Emergency department assessment of suicidal patients.	Rives W	1999	No intervention/ No description of intervention
Emergency action... emergency psychiatric nurse.	Roberts M; Taylor B		No intervention/ No description of intervention
Psychiatric consultation and referral of persons who have attempted suicide: The perspective of heads of emergency and psychiatry departments	Roelands, Marc; Deschepper, Reginald; Bilsen, Johan	2017	No intervention/ No description of intervention
Screening Preteens in the Emergency Department for Suicide Risk	Rubin R.	2019	No intervention/ No description of intervention
Hospital Emergency Department Lethal Means Counseling for Suicidal Patients.	Runyan CW; Brooks-Russell A; Tung G; Brandspigel S; Betz ME; Novins DK; Agans R	2018	No intervention/ No description of intervention
Preventing suicide in the emergency department	Ryan C.J.; Large M.M.	2015	Wrong information source
Enhancing Key Competencies of Health Professionals in the Assessment and Care of Adults at Risk of Suicide Through Education and Technology.	Ryan, Kathryn; Tindall, Claudia; Strudwick, Gillian	2017	Wrong population
Pioneering task force addresses suicide in the ED.	Schanne L; deSimone M	n.d	No intervention/ No description of intervention
Care of the suicidal pediatric patient in the ED: A case study	Schmid A.M.; Truog A.W.; Damian F.J.	2011	No intervention/ No description of intervention
Suicide risk assessment and management training practices in pediatric residency programs: A nationwide needs assessment survey	Schoen L.E.; Bogetz A.L.; Bernert R.A.	2018	Wrong population
Deliberate self harm prevention in Pakistan	Shahid M.	2013	Wrong population
Preventing Suicides in Emergency Departments and Inpatient Psychiatric Units: Standards of Care	Shattell M.	2017	No intervention/ No description of intervention
Preventing Suicides in Emergency Departments and Inpatient Psychiatric Units.	Shattell, Mona	2017	No intervention/ No description of intervention
The Effect of a Dedicated Psychiatric Team to Pediatric Emergency Mental Health Care	Sheridan D.C.; Sheridan J.; Johnson K.P.; Laurie A.; Knapper A.; Fu R.; Appy S.; Hansen M.L.	2016	Wrong topic
Pilot testing and preliminary evaluation of a suicide prevention education	Shim, Ruth S.; Compton, Michael T.	2010	Wrong population

Title	Authors	Year	Reasons for exclusion
program for emergency department personnel			
The effects of case management program completion on suicide risk among suicide attempters: A 5-year observational study	Shin H.J.; Park G.J.; In Y.N.; Kim S.C.; Kim H.; Lee S.W.	2019	Intervention does not target professional behaviour change
Innovative use of crisis intervention services with psychiatric emergency room patients	Simakhodskaya Z.; Haddad F.; Quintero M.; Malavade K.	2009	Wrong topic
Wraparound care for youth injured by violence: A randomized control trial	Snider C.; Chernomas W.; Cook K.; Jiang D.; Klassen T.; Logsetty S.; Mahmood J.; Mordoch E.; Strome T.	2016	Wrong topic
Implementation of ed based in-depth surveillance for suicidal attempt: Descriptive study	Song K.J.; Hong K.J.; Shin S.D.; Lyoo I.K.; Choi J.S.	2012	No intervention/ No description of intervention
Telemental health evaluations enhance access and efficiency in a critical access hospital emergency department	Southard E.P.; Neufeld J.D.; Laws S.	2014	Wrong topic
An intervention trial to improve adherence to community treatment by adolescents after a suicide attempt	Spirito, Anthony; Boergers, Julie; Donaldson, Deidre; Bishop, Duane; Lewander, William	2002	Wrong population
Comparison of the safety planning intervention with follow-up vs usual care of suicidal patients treated in the emergency department	Stanley, Barbara; Brown, Gregory K.; Brenner, Lisa A.; Galfalvy, Hanga C.; Currier, Glenn W.; Knox, Kerry L.; Chaudhury, Sadia R.; Bush, Ashley L.; Green, Kelly L.	2018	Intervention does not target professional behaviour change
Brief intervention and follow-up for suicidal patients with repeat emergency department visits enhances treatment engagement	Stanley, Barbara; Brown, Gregory K.; Currier, Glenn W.; Lyons, Chelsea; Chesin, Megan; Knox, Kerry L.	2015	Intervention does not target professional behaviour change
An emergency department intervention and follow-up to reduce suicide risk in the VA: Acceptability and effectiveness	Stanley, Barbara; Chaudhury, Sadia R.; Chesin, Megan; Pontoski, Kristin; Bush, Ashley Mahler; Knox, Kerry L.; Brown, Gregory K.	2016	Wrong population
Emergency: communicating with ED patients who have chronic mental illnesses.	Stanton K	2007	Wrong topic
A nurse-led pathway to treat self-harm injuries	Steel M.	2015	Intervention does not target professional behaviour change
Community psychiatric nursing intervention in an accident and emergency department: a clinical pilot study.	Storer D.; Whitworth R.; Salkovskis P.; Atha C.	1987	Intervention does not target professional behaviour change

Title	Authors	Year	Reasons for exclusion
Improving the response to people presenting to the emergency department with behaviours of concern	Symons E.; Hobbs B.	2019	Wrong information source
Clinical notice board. The impact of a training package for accident and emergency nurses on parasuicide patient contact: a proposed study.	Turnbull G	1994	Wrong study design
The impact of a training package for accident and emergency nurses on parasuicide patient contact: a proposed study.	Turnbull G.	1994	Intervention not implemented
Effect of telephone contact on further suicide attempts in patients discharged from an emergency department: Randomised controlled study	Vaiva, Guillaume; Ducrocq, François; Meyer, Philippe; Mathieu, Daniel; Philippe, Alain; Libersa, Christian; Goudemand, Michel	2006	Intervention does not target professional behaviour change
Telemedicine is associated with rapid transfer and fewer involuntary holds among patients presenting with suicidal ideation in rural hospitals: a propensity matched cohort study.	Vakkalanka JP; Harland KK; Wittrock A; Schmidt M; Mack L; Nipe M; Himadi E; Ward MM; Mohr NM	2019	Wrong population
Emergency department care for patients with mental health problems, a longitudinal registry study and a before and after intervention study.	Van Der Linden, M. Christien; Balk, Ferdi J.E.; Van Der Hoeven, Bastiaan J.H.; Van Loon, Merel; De Voeght, Frans J.; Van Der Linden, Naomi	2019	Wrong topic
Adolescents with suicidal behavior: Results from a new clinical intervention protocol at the Sant Joan De Déu University Hospital in Barcelona (Spain)	Vila M.; Picouto M.; Villar F.; Sánchez B.	2015	No intervention/ No description of intervention
Toward zero suicide in health care: Reflections from meeting the Joint Commission mandate for evidence-based suicide screening.	Walters, Anne	2019	Wrong information source
Family-Based Crisis Intervention with Suicidal Adolescents: A Randomized Clinical Trial	Wharff E.A.; Ginnis K.B.; Ross A.M.; White E.M.; White M.T.; Forbes P.W.	2019	Intervention does not target professional behaviour change
An empirical approach to assessing training needs for emergency department management of intentional self-harm and related behaviors in the United States	Whitehead M.; Shahidullah J.; Kettlewell P.; Quinlan N.; Strony R.	2017	Wrong topic
Simplified universal screening for suicide at triage wastes emergency department resources	Wilson M.P.; Simanjuntak J.; Anderson L.; Vilke G.M.	2015	No intervention/ No description of intervention
Screening for suicide risk in the pediatric emergency and acute care setting	Wintersteen M.B.; Diamond G.S.; Fein J.A.	2007	Wrong study design

Title	Authors	Year	Reasons for exclusion
Assessment and Management of Self Harm in Emergency Departments in Ireland: The National Clinical Programme.	Wrigley, Margo; Jennings, Rhona; MacHale, Siobhan; Cassidy, Eugene	2017	No intervention/ No description of intervention
General hospital suicide risk screening: Validation of the sad persons and its implications	Wu C.-Y.; Liu S.-I.; Huang H.-C.	2012	Wrong population
Clinical Practice Guideline: Suicide Risk Assessment	Zaleski M.E.; Johnson M.L.; Valdez A.M.; Bradford J.Y.; Reeve N.E.; Horigan A.; Killian M.; Slivinski A.; Stapleton S.; Vanhoy M.A.; Proehl J.	2018	Wrong study design
A mobile crisis program: Collaboration between emergency psychiatric services and police	Zealberg, Joseph J.; Christie, Scott D.; Puckett, Jackie A.; McAlhany, Deborah; Durban, M.	1992	Wrong topic
Usual care for emergency department patients who present with suicide risk: A survey of hospital procedures in washington state	Zhou, Eric; DeCou, Christopher R.; Stuber, Jennifer; Rowhani-Rahbar, Ali; Kume, Kosuke; Rivara, Frederick P.	2019	No intervention/ No description of intervention
Comparison of an suicide assessment tool to usual care	Zun L.; Downey L.	2018	No intervention/ No description of intervention
Assessment and referral for treatment of patients at risk for suicide in the Emergency Department	Zun L.; Downey L.; Burke T.	2015	Wrong population
Brief intervention in ED reduces risk for 6 months.	NA	2018	Intervention does not target professional behaviour change
Could a suicidal patient be discharged from ED?	NA	2011	No intervention/ No description of intervention
ED accreditation update. To comply with new patient safety goal, here's how to assess patients for suicide risk.	NA	2006	Wrong information source
Keep your eye on…...suicide risk screening tool for emergency departments.	NA	2014	Wrong information source
Study will focus on	NA	2011	Wrong study design

APPENDIX 7: EXCLUDED CITATIONS WITH REASONS (RESULTS FROM THE TARGETED GOOGLE SEARCH)

Website Source	Title	URL	Reasons for exclusion
Suicide Prevention Resource Center	Working with emergency departments: New tools and grantee models	https://www.sprc.org/sites/default/files/migrate/library/8ALitts.pdf	Doesn't say who the audience is
Suicide Prevention Resource Center	Suicidal Patients in the Emergency Department: Improving Care through Partnerships with Crisis Centers	https://www.sprc.org/events-trainings/suicidal-patients-emergency-department-improving-care-through-partnerships-crisis	Doesn't say who the audience is
Suicide Prevention Resource Center	Working with emergency departments: Expanding crisis center resources and partnerships	https://www.sprc.org/sites/default/files/migrate/library/8ACook.pdf	Doesn't say who the audience is
AHRQ: Agency for Healthcare Research and Quality	Opportunities for Suicide Prevention in the Emergency Department	https://www.ahrq.gov/chain/research-tools/featured-certs/opportunities-for-suicide-prevention.html	Doesn't say who the audience is
California Hospital Association	Management of Suicidal Patients in Emergency Departments: Recent Innovations in Care	https://www.calhospital.org/sites/main/files/file-attachments/mngmntofsuicidalpts.pdf	Duplicate
The Joint Commission	Suicide Prevention Resources to support Joint Commission Accredited organizations implementation of NPSG 15.01.01, revised November 2018 pdf	https://www.jointcommission.org/standards/national-patient-safety-goals/-/media/83ac7352b9ee42c9bda8d70ac2c00ed4.ashx	Duplicate
SAMHSA Substance Abuse and Mental Health Services Administration	Is Your Patient Suicidal?	http://www.sprc.org/sites/default/files/migrate/library/ER_SuicideRiskPosterVert2.pdf	Duplicate
Patient Safety Authority	Emergency Department Management of the Suicidal Patient	http://patientsafety.pa.gov/ADVISORIES/Pages/200512_18.aspx	No intervention or no description of intervention
St. Joseph Health care	Screening for Suicidality in the Emergency Department	https://www.omne.org/wp-content/uploads/2016/12/Abstract-Presentation-1130am-K.Holst_.pdf	No intervention or no description of intervention

Website Source	Title	URL	Reasons for exclusion
St. Joseph's Healthcare Hamilton	St. Joseph's Healthcare Hamilton Suicide Prevention Work Plan for Implementation of External Review Recommendations	https://www.stjoes.ca/suicideprevention/suicide-prevention-external-recommendations-implementation-working-plan-update-march-2018-final.pdf	No intervention or no description of intervention
Healthy Salt Lake	Emergency Room Intervention for Suicidal Adolescent Females	http://www.healthysaltlake.org/promisepractice/index/view?pid=30123	No intervention or no description of intervention
Suicide Prevention Resource Center	Preventing suicide in emergency department patients	https://www.sprc.org/resources-programs/preventing-suicide-emergency-department-patients	No public access
Canadian Patient Safety Institute	Suicide Risk Assessment Guide A Resource for Health Care Organizations pdf	https://www.patientsafetyinstitute.ca/en/toolsResources/SuicideRisk/Documents/Suicide%20Risk%20Assessment%20Guide.pdf#search=%22suicide%22%20%22self%20harm%22%20%22emergency%20department%22	Wrong population or not specific to ED staff
Suicide Prevention Resource Center	Zero Suicide Webinar: The Emerging Zero Suicide Paradigm	https://www.sprc.org/events-trainings/emerging-zero-suicide-paradigm	Wrong population or not specific to ED staff
Suicide Prevention Resource Center	The role of emergency medical services providers in preventing suicide	https://www.sprc.org/sites/default/files/resource-program/EMS.pdf	Wrong population or not specific to ED staff
Suicide Prevention Resource Center	Emergency Department Means Restriction Education	https://www.sprc.org/resources-programs/emergency-department-means-restriction-education	Wrong population or not specific to ED staff
Suicide Prevention Resource Center	Breaking through barriers: The emerging role of healthcare provider training programs in firearm suicide prevention	http://efsgv.org/wp-content/uploads/2017/09/Breaking-through-Barriers-September-2017-Consortium-for-Risk-Based-Firearm-Policy-FINAL.pdf	Wrong population or not specific to ED staff

Website Source	Title	URL	Reasons for exclusion
National Suicide Prevention Lifeline	FOLLOWING UP WITH INDIVIDUALS AT HIGH RISK FOR SUICIDE: DEVELOPING A MODEL FOR CRISIS HOTLINE AND EMERGENCY DEPARTMENT COLLABORATION	https://suicidepreventionlifeline.org/wp-content/uploads/2016/09/Lifeline-Crisis-Center-ED-Paper-1.6.pdf	Wrong population or not specific to ED staff
Alberta Health Services	Preventing Suicide Injury Prevention & Safety, Information for Health Professionals	https://www.albertahealthservices.ca/injprev/Page4875.aspx	Wrong population or not specific to ED staff
Registered Nurses' Association of Ontario	Assessment and Care of Adults at Risk for Suicidal Ideation and Behaviour pdf	https://rnao.ca/sites/rnao-ca/files/Assessment_and_Care_of_Adults_at_Risk_for_Suicidal_Ideation_and_Behaviour_0.pdf	Wrong population or not specific to ED staff
HSE Our Health Service	National Clinical Programme For the Assessment and Management of Patients Presenting to Emergency Departments following Self-Harm pdf	https://www.drugsandalcohol.ie/25314/1/nationalclinicalprogselfharm.pdf	Wrong population or not specific to ED staff
Health Resources & Services Administration	CRITICAL CROSSROADS: PEDIATRIC MENTAL HEALTH CARE IN THE EMERGENCY DEPARTMENT A Care Pathway Resource Toolkit	https://www.hrsa.gov/sites/default/files/hrsa/critical-crossroads/critical-crossroads-tool.pdf	wrong topic (not specific to suicide prevention)
American College of Emergency Physicians	Practical Solutions to Boarding of Psychiatric Patients in the Emergency Department pdf	https://www.macep.org/Files/Behavioral%20Health%20Boarding/Practical%20Solutions%20to%20Boarding%20of%20Psych%20Patients%20in%20EDs.pdf	wrong topic (not specific to suicide prevention)
Thesis	A manual for emergency room social workers pdf	https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=3835&context=open_access_etds	wrong topic (not specific to suicide prevention)
Action Alliance	Recommended Standard Care for People with Suicide Risk:	https://theactionalliance.org/sites/default/files/action_alliance_re	Wrong topic (not specific to suicide prevention)

Website Source	Title	URL	Reasons for exclusion
		commended_standard_care_final.pdf	
The Royal College of Medicine	Mental Health in Emergency Departments A Toolkit for Improving Care	https://www.rcem.ac.uk/docs/RCEM%20Guidance/CEM6883-Mental%20Health%20in%20ED_Toolkit.pdf	wrong topic (not specific to suicide prevention)

APPENDIX 8. FULL METHODOLOGICAL ASSESSMENT

Table 8-1. Randomized Control Trial

Authors (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	%
Clarke et al., 2002	Yes	Yes	Yes	No	No	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	69
van Landschoot et al., 2017	Yes	Yes	Yes	No	No	No	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	62
Total count	2	2	2	0	0	0	1	1	1	2	2	2	2	
Total %	100	100	100	0	0	0	50	50	50	100	100	100	100	

Q1: Was true randomization used for assignment of participants to treatment groups? Q2: Was allocation to treatment groups concealed? Q3: Were treatment groups similar at the baseline? Q4: Were participants blind to treatment assignment? Q5: Were those delivering treatment blind to treatment assignment? Q6: Were outcomes assessors blind to treatment assignment? Q7: Were treatment groups treated identically other than the intervention of interest? Q8: Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? Q9: Were participants analyzed in the groups to which they were randomized? Q10: Were outcomes measured in the same way for treatment groups? Q11: Were outcomes measured in a reliable way? Q12: Was appropriate statistical analysis used? Q13: Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

Table 8-2. Quasi-Experimental Design

Authors (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	%
Ahn et al., 2020	Yes	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	78
Appleby et al., 2002	Yes	Yes	Unclear	No	Yes	Unclear	Yes	Unclear	Yes	56
Betz et al., 2015	Yes	Yes	Unclear	No	Yes	Unclear	Yes	Unclear	Yes	56
Boudreaux et al., 2016	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	89
Crawford et al., 1998	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67
Currier et al., 2012	Yes	Yes	Unclear	Yes	Yes	Unclear	Yes	No	Yes	75
Fendrich et al., 1998	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	78
Giordano R & Stichler , 2009	Yes	Yes	Unclear	No	Yes	Unclear	Yes	No	Yes	56
Hackfeld et al ., 2020	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67
Horwitz et al., 2011	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67
Kawashima et al., 2020	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67

Authors (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	%
Kishi et al., 2014	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67
Lygnugaryte-Griksiene et al., 2018	Yes	Yes	Unclear	No	Yes	Unclear	Yes	Yes	Yes	67
McAllister, Zimmer-Gembeck et al., 2008	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	No	Yes	78
Morgan et al., 2000	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	78
O'Neill et al., 2001	Yes	Yes	Unclear	No	Yes	Unclear	Unclear	No	Unclear	33
Reshetukha et al., 2018	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	78
Runyan et al ., 2016	Yes	Yes	Unclear	No	Yes	Yes	Yes	No	Yes	67
Stone et al., 2002	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	78
Suokas et al., 2009	Yes	Yes	Unclear	No	Yes	Unclear	Yes	No	Yes	56
Turnbull et al., 1997	Yes	Yes	Unclear	No	Yes	No	Yes	No	Yes	56
Total Count	21	21	2	5	21	11	20	5	20	
Total %	100	100	10	24	100	52	95	24	95	

Q1: Is it clear in the study what is the 'cause' and what is the 'effect' i.e. there is no confusion about which variable comes first)? Q2: Were the participants included in any comparisons similar? Q3: Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? Q4: Was there a control group? Q5: Were there multiple measurements of the outcome both pre and post the intervention/exposure? Q6: Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? Q7: Were the outcomes of participants included in any comparisons measured in the same way? Q8: Were outcomes measured in a reliable way? Q9: Was appropriate statistical analysis used?

Table 8-3. Cohort Study

Authors (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	%
Ballard et al., 2017	N/A	unclear	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	N/A	Yes	78
Dennis et al., 2001	Unclear	No	N/A	No	N/A	No	Yes	Unclear	Unclear	N/A	Yes	25
DeVylder et al., 2020	Yes	No	N/A	No	N/A	No	Yes	Yes	Unclear	N/A	Yes	50
Total Count	1	0	1	1	1	0	3	2	1	0	3	
Total %	33	0	33	33	33	0	100	67	33	0	100	

Q1: Were the two groups similar and recruited from the same population? Q2: Were the exposures measured similarly to assign people to both exposed and unexposed groups? Q3: Was the exposure measured in a valid and reliable way? Q4: Were confounding factors identified? Q5: Were strategies to deal with confounding factors stated? Q6: Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)? Q7: Were the outcomes measured in a valid and reliable way? Q8: Was the follow up time reported and sufficient to be long enough for outcomes to occur? Q9: Was follow up complete, and if not, were the reasons to loss to follow up described and explored? Q10: Were strategies to address incomplete follow up utilized? Q11: Was appropriate statistical analysis used?

Table 8-4. Cross-Sectional Study

Authors (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	%
Brovelli et al., 2017	Yes	Yes	No	No	Yes	No	No	Yes	50
Canady et al., 2018	No	Yes	No	Yes	No	No	Yes	N/A	43
Wiesel Cullen et al ., 2020	Yes	Yes	No	Yes	No	No	No	Yes	40
Total Count	2	3	0	2	1	0	1	2	
Total %	67	100	0	67	33	0	33	67	

Q1: Were the criteria for inclusion in the sample clearly defined? Q2: Were the study subjects and the setting described in detail? Q3: Was the exposure measured in a valid and reliable way? Q4: Were objective, standard criteria used for measurement of the condition? Q5: Were confounding factors identified? Q6: Were strategies to deal with confounding factors stated? Q7: Were the outcomes measured in a valid and reliable way? Q8: Was appropriate statistical analysis used?

Table 8-5. Qualitative Study

Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	%
Chesin et al ., 2017	Unclear	Unclear	Yes	Yes	No	No	No	Yes	N/A	Yes	44

Q1: Is there congruity between the stated philosophical perspective and the research methodology? Q2: Is there congruity between the research methodology and the research question or objectives? Q3: Is there congruity between the research methodology and the methods used to collect data? Q4: Is there congruity between the research methodology and the representation and analysis of data? Q5: Is there congruity between the research methodology and the interpretation of results? Q6: Is there a statement locating the researcher culturally or theoretically? Q7: Is the influence of the researcher on the research, and vice- versa, addressed? Q8: Are participants, and their voices, adequately represented? Q9: Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body? Q10: Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

Table 8-6. Mixed-Method Study

Authors	S1	S2	Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q2.1	Q2.2	Q2.3	Q2.4	Q2.5	Q3.1	Q3.2	Q3.3
Mcallister, Billett et al., 2009	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Q3.4	Q3.5	Q4.1	Q4.2	Q4.3	Q4.4	Q4.5	Q5.1	Q5.2	Q5.3	Q5.4	Q5.5	% quality criteria met		
	N/A	N/A	Yes	Yes	Yes	Can't tell	Yes	No	Yes	Yes	Can't tell	Yes	60%		
Authors	S1	S2	Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q2.1	Q2.2	Q2.3	Q2.4	Q2.5	Q3.1	Q3.2	Q3.3
Dimeff et al., 2020	Yes	Yes	Yes	Yes	Can't tell	No	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Q3.4	Q3.5	Q4.1	Q4.2	Q4.3	Q4.4	Q4. 5	Q5.1	Q5.2	Q5.3	Q5.4	Q5.5	% quality criteria met		
	N/A	N/A	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	No	Can't tell	Yes	60		

Authors	S1	S2	Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q2.1	Q2.2	Q2.3	Q2.4	Q2.5	Q3.1	Q3.2	Q3.3
Mueller et al., 2020	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Q3.4	Q3.5	Q4.1	Q4.2	Q4.3	Q4.4	Q4.5	Q5.1	Q5.2	Q5.3	Q5.4	Q5.5	% quality criteria met		
	N/A	N/A	Can't tell	Yes	Yes	Yes	Can't tell	N/A	N/A	N/A	N/A	N/A	60		

S1: Are there clear research questions? S2: Do the collected data allow to address the research questions? Q1.1: Is the qualitative approach appropriate to answer the research question? Q1.2: Are the qualitative data collection methods adequate to address the research question? Q1.3: Are the findings adequately derived from the data? Q1.4: Is the interpretation of results sufficiently substantiated by data? Q1.5: Is there coherence between qualitative data sources, collection, analysis and interpretation? Q2.1: Is randomization appropriately performed? Q2.2: Are the groups comparable at baseline? Q2.3: Are there complete outcome data? Q2.4: Are outcome assessors blinded to the intervention provided? Q2.5: Did the participants adhere to the assigned intervention? Q3.1: Are the participants representative of the target population? Q3.2: Are measurements appropriate regarding both the outcome and intervention (or exposure)? Q3.3: Are there complete outcome data? Q3.4: Are the confounders accounted for in the design and analysis? Q3.5: During the study period, is the intervention administered (or exposure occurred) as intended? Q4.1: Is the sampling strategy relevant to address the research question? Q4.2: Is the sample representative of the target population? Q4.3: Are the measurements appropriate? Q4.4: Is the risk of nonresponse bias low? Q4.5: Is the statistical analysis appropriate to answer the research question? Q5.1: Is there an adequate rationale for using a mixed method design to address the research question? Q5.2: Are the different components of the study effectively integrated to answer the research question? Q5.3: Are the outputs of the integration of qualitative and quantitative components adequately interpreted? Q5.4: Are divergences and inconsistencies between quantitative and qualitative results adequately addressed? Q5.5: Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

Table 8-7. Quality Improvement Reports

Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	% Met
Cracknell 2015	Met	Met	Met	Not met	Met	Not met	Met	Met	Met	Met	Not met	Not met	Not met	Not met	Not met	Met	56
Huline-Deckens 2007	Met	Met	Met	Not met	Met	Not met	Not met	Met	Not met	Not met	Not met	Not met	Not met	Not met	Not met	Met	38
Total Count	2	2	2	0	2	0	1	2	1	1	0	0	0	0	0	2	
Total %	100	100	100	0	100	0	50	100	50	50	0	0	0	0	0	100	

Q1: Organizational Motivation: Organizational problem, reason, or motivation for the intervention Q2: Intervention Rationale: Rationale linking the intervention to its expected effects Q3: Intervention Description: Change in organizational or provider behavior Q4: Organizational Characteristics: Demographics or basic characteristics of the organization Q5: Implementation: Temporary activities used to introduce potentially enduring changes Q6. Study Design: Study design and comparator Q7: Comparator: Information about comparator care processes Q8: Data Source: Data source and outcome definition Q9:Timing: Timing of intervention and evaluation Q10: Adherence / Fidelity: Adherence to the intervention Q11: Health Outcomes: Patient health-related outcomes Q12: Organizational Readiness: Barriers and facilitators to readiness Q13: Penetration / Reach: Penetration / reach of the intervention Q14: Sustainability: Sustainability of the intervention Q15: Spread: Ability to be spread or replicated Q16: Limitations: Interpretation of the evaluation

Table 8-8. Reasons for No Quality Assessment

Authors (Year)	Study Design	Reasons
Beaver 2016	Cross sectional study	Thesis, grey literature
Boudreaux et al., 2020	Non-randomised experimental study	Incomplete analysis
Krishnaiah et al., 2019	Non-randomised experimental study	Abstract
Lebo 1995	Quasi-experimental Study	Thesis, grey literature
McAllister, Moyle et al., 2009	Mixed-methods	Author states mixed methods, however only reported qualitative data. Incomplete report/analysis
Vaughan 2019	Cross sectional study	Thesis, grey literature
National Suicide Research Foundation Ireland, 2006	Mixed-methods	Report, grey literature

APPENDIX 9. LIST OF ORGANIZATIONS/WEBSITES INCLUDED IN THE REVIEW

Organization or Website name (n=19)	Number of interventions included (n=29)
Suicide Prevention Resource Center	6
Ministry of Health, New Zealand	2
Substance Abuse and Mental Health Services Administration	2
American College of Emergency Physicians	2
Emergency Nurses Association	2
A Victorian Government Initiative	2
National institute of mental health	1
Seattle Children's Hospital	1
Blackdog Institute	1
Safe alternatives Self Abuse finally Ends	1
National Institute for Health and Care Excellence	1
emDOCs	1
Department of Mental Health and Substance Abuse Services	1
Ohio American College of Emergency Physicians	1
MN Health Collaborative	1
Mental Health Hospital Lalitur and Psychiatrsts' Association Nepal	1
The New South Wales Ministry of Health	1
Lenus The Irish Health Repository	1
National Suicide Research Foundation Ireland	1

APPENDIX 10. EXAMPLE INTERVENTIONS AND REPRESENTATIVE QUOTES

Example interventions, along with direct quotes from the literature. Check marks represent interventions' target determinants of behaviour.

				Identified Barriers from section **2.2**					
					Lack of knowledge, interpersonal/ cognitive skills	Social influences, Lack of support	Lack of time, resources, physical support	Skepticism, lack of confidence, perceived knowledge	Negative emotions
				Behaviour Determinants					
				Capability		Opportunity		Motivation	
	Author, year	Representative quotes	Intervention Functions	Physical	Psychological	Social	Physical	Reflective	Automatic
Example Intervention 1	SPRC, 2008	"10% of all ED patients are thinking of suicide, but most don't tell you. Ask questions—save a life."	*Persuasion*					✓	✓
Example Intervention 2	van Landschoot et al., 2017	"The poster and guide were displayed for four weeks in strategic staff-only sites such as meeting rooms, lunchrooms and staff toilets"	*Environmental restructuring*				✓		✓

	Author, year	Representative quotes	Intervention Functions	Physical	Psychological	Social	Physical	Reflective	Automatic
Example Intervention 3	SPRC, 2011	"This webinar presents a cross-section of promising and evidence-based strategies for preventing suicide among patients visiting the ED, including continuity of care." "Consumers and family members also reported negative experiences involving a perception of unprofessional staff behavior, feeling the suicide attempt was not taken seriously, and long wait times"	*Education*		✓			✓	
			Persuasion					✓	✓
Example Intervention 4	Dennis et al., 2001	"All new senior house officers were required to attend a one-to-two-hour training seminar conducted by a senior lecturer in psychiatry. The seminar included information on the epidemiology of DSH, the principles and purpose of risk assessment, the psychosocial assessment itself, and the service offered by the local specialist DSH team." "…we encouraged staff to use a pre-printed checklist for risk assessment… The checklist contains… a brief history of the DSH [Deliberate Self Harm] event; previous medical and psychiatric history; social circumstances and background. "… the workings hours of the specialist DSH team were extended from a normal 9 am to 5 pm service to include weekday evenings until 9 pm. DSH team members will provide mental health assessments on patients presenting with self-harm if requested by A&E medical staff. A&E medical staff were also encouraged to contact the team and ask for supervision in assessment of cases if required. (Dennis et al., 2001)	*Education*		✓			✓	
			Training		✓				
			Enablement		✓	✓			
			Environmental restructuring		✓	✓	✓		

	Author, year	Representative quotes	Intervention Functions	Physical	Psychological	Social	Physical	Reflective	Automatic
Example Intervention 5	Hackfeld, 2020	"Educational interventions were created and included: (a) creation of a computer-based PowerPoint education module with audio to explain the evidence behind and benefits of suicide screening in the ED; (b) a video presentation depicting the administration of ASQ and how to support a concerned parent; and (c) a handout guiding documentation in the EMR." "The handouts were distributed and available at each nursing station." "Next, a 5-minute video presentation was created …to demonstrate how to administer ASQ using the script and address the concerns of an upset parent. The ED educator participated in the video by administering the ASQ, which provided a familiar nurse for the ED staff members to model." "A script was created and included in the electronic medical record (EMR) assessment to assist ED nurses in administering the suicide screening questions."	*Education*		✓			✓	
			Training		✓		✓		
			Environmental restructuring				✓		
			Modelling			✓			
			Enablement		✓				

	Author, year	Representative quotes	Intervention Functions	Physical	Psychological	Social	Physical	Reflective	Automatic
Example Intervention 6	Boudreaux et al., 2020	"The intervention consisted of refresher training on universal screening, new training on the [Safety Planning Intervention] SPI and using [Continuous Quality Improvement Approach] CQI teams (called "Lean Teams") to identify and remediate care gaps, and to monitor, improve, and sustain these efforts." SPI: "The in-person workshop focused on skills necessary to implement safety planning and utilized didactics, review of the manual, live and/or recorded modeling demonstration, and participant role-playing. Each site trainer was tasked with training other clinicians and helping to oversee implementation of the SPI" Competence in the SPI for the site trainer was determined through role playing of a standardized patient, a common method for establishing competence when actual observation or recordings with patients are impossible." Screening: "Electronic health record integration (ranging from simple integration of the screening items only through programming of "hard stops" that mandated screening completion), ongoing training, data reporting and feedback, and spot checks with frontline staff."	*Training*		✓				
			Education		✓			✓	
			Modelling					✓	
			Enablement		✓				
			Environmental restructuring		✓		✓		
			Persuasion					✓	