



Hospital-Based Harm Reduction Interventions: A Systematic Review

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Abstract

Background: In the U.S., the number of hospitalized patients diagnosed with a substance use disorder (SUD; e.g., opioid use disorder, alcohol use disorder) is growing at an alarming rate. Often negatively impacted by stigma, homelessness and physical and mental comorbidities, this vulnerable patient population may benefit from the use of hospital-based harm reduction interventions (HHRIs) to improve overall hospital care experiences and negative health outcomes.

Purpose: To examine how harm reduction principles have been successfully applied to HHRIs resulting in decreased negative health outcomes associated with SUD, improved healthcare provider-patient relationships, and reduced financial burden of healthcare systems.

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and flow diagram were utilized for this systematic review. Nineteen studies met the eligibility criteria for inclusion in the review.

Implications: Four consistent themes that either inhibit or facilitate the implementation of HHRIs (e.g., establishing specialized SUD hospital units, employing peer support specialists, utilizing the clinical opiate withdrawal scale) were identified: ethical responsibility, stigma, structural changes to hospital systems, and noted gaps associated with post-discharge care.

Conclusion: HHRIs are a useful treatment option to manage the unique needs associated with the growing SUD patient population.

Keywords: Harm reduction, substance use disorder, SUD, opioid use disorder, OUD, acute care hospital

Background

Harm reduction is defined as “interventions aimed at reducing the negative effects of health behaviors without necessarily extinguishing the problematic health behaviors completely or permanently” (Hawk et al., 2017, p. 1). The evidence-based and cost-effective practices of harm reduction can easily be applied to acute care hospital settings. An estimated 15% of patients in an acute care hospital have a substance use disorder (SUD), and often require cost-intensive, sometimes onerous, healthcare-related interventions (Trowbridge et al., 2017). In addition, this patient population is commonly discharged from the hospital against medical advice (AMA) leading to further negative health consequences (Ti & Ti, 2015).

The purpose of this review is to not only define harm reduction but examine how its principles have been successfully applied to hospital-based harm reduction interventions (HHRIs) resulting in decreased negative health outcomes associated with SUD, improved healthcare provider-patient relationships, and reduced financial burden of healthcare systems. The focus will be a systematic review on the utilization of harm reduction interventions within acute care hospitals furthering the discussion on HHRIs strengths, limitations, and recommendations for future use.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and flow diagram (see Appendix A) were utilized for this systematic review (Moher et al., 2009).

Search Strategy

The following three databases were utilized to identify applicable studies found in peer-reviewed journals from 2010 to 2021: CINAHL Complete, PubMed, and Google Scholar. The following keywords were consistently used for each database: “harm reduction,” “hospital,” “acute care,” “addiction consult services,” and “substance use disorder.” Case reports were not excluded, but acknowledged, due to the burgeoning nature of the subject. A hand searching (a methodological process that includes, but is not limited to, searching journal content, and references lists for relevant articles that may have been missed during the initial database searches) of reference lists of published studies yielded relevant works that were included in the review. Studies were restricted to the English language and adult populations.

Inclusion and Exclusion Criteria

Studies were included if they were published in peer-reviewed journals. Original studies were retained if they included harm reduction interventions for acute care patients with SUD as a broad diagnosis or a more specific diagnosis (e.g., opioid use disorder [OUD], alcohol use

disorder [AUD], stimulant use disorder). Due to the interest of harm reduction interventions within the acute care hospitals, studies were excluded if the reported setting was a clinic (e.g., safe injection site, urgent care, primary care office), psychiatric hospital, emergency department, or drug and alcohol treatment facility. Grey literature (e.g., preliminary progress reports, theses, dissertations, memoranda, and conference papers) were excluded.

Results

Database and manual searching identified 58 potentially eligible studies: PubMed (n=19), CINAHL Complete (n=7), Google Scholar (n=12), and other sources (n=20). After duplicate studies were excluded, 44 screened studies were available for analysis; six articles were excluded, based on the aforementioned criteria, which yielded 38 full-text studies. Nineteen full-text studies were ineligible for inclusion based on the wrong setting and/or wrong harm reduction intervention (e.g., syringe service program). In total, 19 studies published between 2010-2021 met the eligibility criteria for inclusion in the systematic review (see Appendix B).

Eighteen of the studies were conducted in the United States or Canada; one was conducted in Australia. Most of the studies (n= 13, [68%]) included SUD patients within their sample population, two of the articles only included health care providers (e.g., physicians, nurses, physician assistants, other staff) in their sample population, and two of the studies included both health care providers and SUD patients. HHRIIs comprised of a supervised inhalation room (n=1), addiction consultation services (n=7), patient-centered care (PCC; [n=3]), motivational interviewing (MI; [n=2]), opioid agonist therapy or medication for treatment (MFT; [n=1]), multidisciplinary discharge planning (n=5), and generalized harm reduction and barriers to implementation (n=3).

One study examined the cost of treatment for infections related to SUD, and harm reduction interventions to decrease this cost. Other studies (n=2) examined the phenomena of SUD patients leaving the acute care hospital AMA, the negative health outcomes associated leaving AMA, and what harm reduction interventions are associated with decreasing AMA discharges. Most of the eligible studies were qualitative inquiries (n=5) and cohort studies (n=5). Followed by systematic reviews (n=2), cross sectional study (n=1), mixed method study (n=1), random controlled trial (n=1), case control study (n=1), and quasi-experimental design (n=1). Two of the articles provided evidence-based practice guidelines.

Theoretical Framework

The design and implementation of complex HHRIIs can be guided by two conceptual frameworks: the harm reduction model and The Consolidated Framework for Implementation Research (CFIR).

Harm Reduction Model

The harm reduction model was first defined by the World Health Organization (WHO)

in 1973 (Ball, 2007). The concept of harm reduction propounded an alternative to the well-established models of treatment for SUD: the moral model (illicit drug consumption is immoral and deserved of criminal punishment), and the disease model (SUD is a biological disease emphasizing abstinence-based treatments; Marlatt, 1996). Harm reduction model is “based on public-health principles and...offers a pragmatic yet compassionate set of principles and procedures designed to reduce the harmful consequences of addictive behavior for both drug consumers and for the society in which they live” (Marlatt, 1996, p. 779). The primary goal of harm reduction is to decrease the mortality rate of people living with SUD (Harm Reduction International [HRI], 2009).

The objectives of the harm reduction model provide an upstream approach for SUD advocacy and are guided by these six principles: humanism, pragmatism, individualism, autonomy, incrementalism, and accountability without termination (Hawk et al., 2017). In the context of the acute care hospital setting, the principles of the harm reduction model aim to reduce the negative health effects of drug and alcohol use by: (a) emphasizing individualized care practices and positive reinforcement; (b) stressing the importance of understanding the root causes of SUD for appropriate multidisciplinary, psychosocial interventions; (c) treating people with SUD compassionately and respectfully while avoiding stigma; (d) abstinence-based practices are never prioritized; and (e) involving patients with SUD in every aspect of their care (Harm Reduction International [HRI], n.d.; Hawk et al., 2017).

The CFIR

Developed by Damschroder et al. (2009), the CFIR was “developed to guide systematic assessment of multilevel implementation contexts to identify factors that might influence intervention implementation and effectiveness” (Keith et al., 2017, p. 2). The domains and constructs of The CFIR can be used as tools of implementation and evaluation of a HHRI by identifying internal and external factors which influence processes and polices, analyzing and simplifying these processes to help reach an outcome, and organizing the findings to evaluate the outcomes (Breimaier et al., 2015; Keith et al., 2017).

The CFIR’s domains and relevant constructs include: (a) intervention characteristics (e.g., key hospital stakeholders’ perceptions of intervention, cost associated with intervention, and complexity); (b) outer setting, or external factors influencing implementation of intervention (e.g., U.S. cultural ideas on harm reduction interventions and public policies); (c) inner setting, or internal factors influencing implementation of intervention (e.g., hospital or ward culture surrounding harm reduction, stigmatization of SUD patients, and hospital-specific policies to implement intervention); (d) characteristics of individuals (e.g., hospital staff’s knowledge about the intervention and readiness for change); and (e) process (e.g., engagement of key hospital stakeholders with planning and implanting the intervention through education, reflecting, and evaluation; (Damschroder et al., 2009; Keith et al., 2017).

Literature Review

Present-day harm reduction strategies originated from 18th and 19th century European colonies in Asia where harm reduction principles aided those suffering from addiction to alcohol and opium, and 20th century British doctors who prescribed heroin and morphine to those with OUD (Ball, 2007). In the United States, early 20th century drug policies were influenced by abstinence-based practices and ideologies which emphasized drug control through criminalization of people with a SUD. In the 1960s, these abstinence-based laws and healthcare practices were contested with the introduction of medication for treatment (MFT; i.e., methadone programs) to treat patients with OUD (Ball, 2007).

Background

In the U.S., an estimated 22 million people have a SUD (Wakeman et al., 2017) which includes AUD, OUD, and/or stimulant use disorder. Adults with a SUD are often negatively impacted by social determinants of health (e.g., stigma, homelessness, poverty, lack of available community-based healthcare services); as well as physical and mental comorbidities which render them vulnerable to negative health outcomes (Cortina et al., 2018). This population is more susceptible to skin and soft tissue infections, bacteremia or sepsis, endocarditis, osteomyelitis, hepatitis B virus, hepatitis C virus, and HIV (human immunodeficiency virus) infections (Capizzi et al., 2020; McNeil et al., 2016; Velez et al., 2016). Due to an increase in morbidity rates and a 13.8-year decrease in life expectancy amongst people with a SUD (Trowbridge et al., 2017), inpatient hospitalizations and emergency department visits for this patient population has increased at an alarming rate. Nationally, hospitals have seen a 70% increase in infection-related hospitalizations linked to injection drug use, and an annual increase of five percent for hospitalizations related to opioid misuse since 1993 (Trowbridge et al., 2017).

Patients with SUD are more likely to leave hospital acute care settings AMA when compared to the general population (Cortina et al., 2018; Hyshka et al., 2019; McNeil et al., 2016; Sharma et al., 2017; Ti & Ti, 2015; Trowbridge et al., 2017). Leaving a hospital AMA is associated with negative health consequences such as a twofold increase in mortality (Ti & Ti, 2015), higher hospital readmission rates and increased length of stay (Cortina et al., 2018; McNeil et al., 2016; Raven et al., 2011); as well as, increased financial burden for hospital systems as noted by Capizzi et al. (2020) with total costs to treat a serious bacterial infection related to injection drug use increasing from \$16,305,129 in 2008 to \$150,879,237 in 2018. Research suggests SUD patients leave the acute care setting AMA due to healthcare professional biases, stigma (Priest et al., 2020; Sharma et al., 2017; van Boekel et al., 2013), and abstinence-based hospital policies which lead to undertreated pain and unmanaged withdrawal symptoms (Cortina et al., 2018; Hyshka et al., 2019; McNeil et al., 2016; Ti & Ti, 2015; Velez et al., 2016).

Hospital-Based Harm Reduction Interventions

To improve hospital care experiences, cultural safety, and negative health outcomes amongst patients with SUD, research has indicated an urgent need for hospital systems to implement harm reduction interventions (McNeil et al., 2016; Sharma et al., 2017; van Boekel et al., 2013). Evidence supporting the benefits of utilizing HHRI is limited, but irrefutable.

SUD Education for De-stigmatization

Studies have found that healthcare professionals in acute care hospital settings report consistently negative attitudes towards SUD patients, and describe an inability, or unwillingness, to empathize with this patient population (van Boekel et al., 2013). Provider rationalizations for stigmatizations included perceptions that SUD patients are “manipulative, aggressive, rude, and poorly motivated” (van Boekel et al., 2013, p. 29). Studies emphasize the importance of SUD-specific education and training from SUD specialists (i.e., peer support specialists, SUD therapists and providers) to combat the stigma felt by this patient population (Priest et al., 2020; van Boekel et al., 2013).

Furthermore, Englander et al. (2020), examined the use of ECHO (Extension for Community Healthcare Outcomes) as a distance education tool—provided by one Oregon hospital with a SUD program—for urban, rural, and frontier hospitals. Based on a didactic curriculum for treatment of patients with a SUD diagnosis, ECHO successfully provided current, evidence-based research on treatment modalities for SUD, hospital-based harm reduction principles, and provider insight to improve patient-provider relationships and decrease stigma associated with SUDs (Englander et al., 2020).

Patient-Centered Care and Motivational Interviewing

PCC and MI models address the complex needs of SUD patients by underlining the importance of subjective assessment data, emphasizing a holistic approach to care, acknowledging the patient’s lived experiences (i.e., exploring reasons why a patient started using illicit drugs), sharing decision-making power equally, and promoting trusting, positive patient-provider relationships through communication (Martino et al., 2019; McNeil et al., 2016). Studies have highlighted the role of PCC and MI in improving health outcomes of SUD patients by decreasing AMA discharges, improving satisfaction with care, and building patient-provider rapport (Martino et al., 2019; McNeil et al., 2016).

Medication for Treatment

The most common HHRI for the recognition and management of complications related to OUD (i.e., overdose, withdrawal, pain management) and AUD is the use of provider prescribed MFT (Sharma et al., 2017; Trowbridge et al., 2017). MFT for opioid withdrawal includes the use of opioid agonist (methadone), partial mu-opioid agonist (buprenorphine), opioid antagonist

(naloxone) for detoxification, opioid antagonist (naltrexone) to manage symptoms and cravings related to AUD (Trowbridge et al., 2017), and prescription opioids (i.e., injection hydromorphone in place of diacetylmorphine, commonly known as heroin; Sharma et al., 2017; Trowbridge et al., 2017). In their study, Trowbridge et al. (2017) found that nearly 30% of the acute care hospital patients initiated on methadone continued methadone treatment six months post-discharge and, 18% of those patients started on buprenorphine continued their OUD treatment six months post-discharge. These statistics are promising; however, post six-month OUD treatment retention needs further investigation.

The Clinical Opiate Withdrawal Scale (COWS)

Developed by Wesson and Ling (2003), the COWS is an 11-item tool to measure—within two minutes—the severity of opioid withdrawal (see Appendix C). Scores range from zero to 47, and withdrawal is categorized as mild (five to 12), moderate (13 to 24), moderately severe (25 to 36), or severe (greater than 36). Clinical practice guidelines recommend that the initiation of buprenorphine should start when patients with OUD experience mild to moderate withdrawal; additionally, an initial dose of buprenorphine will not precipitate withdrawals for a COWS of 25 or more (Altintoprak et al., 2015; Barbosa-Leiker et al., 2015). Studies have shown that the COWS is a critical, reliable, and valid tool for accurate and rapid assessment of opioid withdrawal symptoms and clinical management of patients with OUD (Altintoprak et al., 2015; Canamo & Tronco, 2019; Tompkins et al., 2009).

Inpatient Addiction Consultations Service (ACS)

Several studies (Priest et al., 2020; Thompson et al., 2020; Trowbridge et al., 2017; Velez et al., 2016; Wakeman et al., 2017) support the use of an inpatient ACSs to improve the treatment and care of SUD patients by decreasing stigmatization practices and improving health outcomes. Shanahan et al. (2010) found the use of inpatient ACSs reduced the use of illicit drugs and alcohol for patients with SUD post-hospitalization: over 80% of discharged SUD patients engaged in follow-up addiction treatment appointments, of which, 11% participated in a long-term recovery program. Furthermore, hospital readmission rates decreased by 75% after SUD patients received support from an ACS while hospitalized (Wei et al., 2014). Positive health outcomes resulting from the use of an inpatient ACS is echoed by Hyshka et al. (2019) who found that some participants had a decrease in the severity of their SUD symptoms post-discharge, and appreciated the team’s “harm reduction orientation, reputation amongst peers, specialized training, and the provision of wraparound health and social supports as key to this success” (p. 4).

Discussion

The findings of this review contribute to a growing literature base on HHRIs, and

the care of the SUD patient population. An overview of the research identified four consistent themes that inhibited the application of HHRI, along with practice recommendations that facilitate the implementation of HHRI. These themes include ethical responsibility, stigma, structural changes to hospital systems, and noted gaps associated with post-discharge SUD care.

Findings demonstrate the potential of HHRI to improve the ethicality of the SUD patient-provider relationship by improving treatment pathways, destigmatizing drug use, targeting and managing pain and withdrawal symptoms, emphasizing holistic care, and addressing racialized inequalities in patient decision making (Cortina et al., 2018; McNeil et al., 2016; Thompson et al., 2020). A small number of studies show that HHRI address the ethical responsibility and legal obligations of treating a patient with a SUD by prioritizing the subjective needs (i.e., withdrawal symptoms) commonly assessed, but often ignored, correlating to decreased suffering and AMA discharges (Martino et al., 2019; McNeil et al., 2016).

Hospitalizations often serve as a motivation for change for individuals who live with a SUD due to an increased awareness of mortality, harms associated with substance use, the psychosocial damages related to lost relationships made aware from the disruption of drug use, and financial costs (Velez et al., 2016). This SUD process insight, along with any potential readiness for change, may be lost due to the perceived stigmatizing attitudes of healthcare providers towards patients with a SUD. Priest et al. (2020) define stigma as: “the complex of attitudes, beliefs, behaviors, and structures that interact at different levels of society (i.e., individuals, groups, organizations, systems) and manifest in prejudicial attitudes about and discriminatory practices against people with mental and substance use disorders” (p. 60). Studies suggest that healthcare professionals exude negative attitudes towards this vulnerable patient population due to behavioral challenges (i.e., aggressiveness, manipulation, poor motivation) brought on by the biopsychosocial process of SUD (Priest et al., 2020; van Boekel et al., 2013).

Most evidence denotes that patients with a SUD feel stigmatized in acute care hospital settings as a result of their disease (Cortina et al., 2018; Englander et al., 2020; Hyshka et al., 2019; McNeil et al., 2016; Priest et al., 2020; Sharma et al., 2017; Ti & Ti, 2015; van Boekel et al., 2013; Velez et al., 2016); specifically, feelings of dehumanization and poor self-efficacy have been reported (Velez et al., 2016; van Boekel et al., 2013) enabling mindsets of mistrust in medicine (Thompson et al., 2020). Furthermore, several studies indicate that pervasive stigma can lead to suboptimal care resulting in delayed treatment for acute illnesses (Cortina et al., 2018; van Boekel et al., 2013), distress from untreated or undertreated pain and withdrawal symptoms (Hyshka et al., 2019; McNeil et al., 2016), and leaving the hospital AMA without completing medical treatment (McNeil et al., 2016; Ti & Ti, 2015; van Boekel et al., 2013). To mitigate stigma and improve negative health outcomes, research supports the use of de-stigmatizing interventions for healthcare professionals like effective education and training (Englander et al., 2020; Hyshka et al., 2019; McNeil et al., 2016; Priest et al., 2020; Sharma et al., 2017; van Boekel et al., 2013).

Harm reduction education and training for healthcare professionals needs to be included within systematic structural changes. Along with leadership support, organizational policy and practices changes within healthcare systems have the potential to improve negative health effects of SUD patients by facilitating the implementation of HHRI (Hyshka et al., 2019). American

hospital systems often support abstinence or zero tolerance-based policies for patients with SUD (Cortina et al., 2018; Hyshka et al., 2019; McNeil et al., 2016). However, research contradicts the use of abstinence-only policies, and favors the use of harm reduction interventions as a more cost-effective approach for SUD treatment which does not enable or increase illicit drug use (Hawk et al., 2017). Additionally, “[abstinence-based policies] are unrealistic—even in the presence of specialized addiction care and effective pain management—because they belie the many neurobiological, psychological, social, and environmental factors that contribute to ongoing substance use despite exceedingly negative consequences” (Hyshka et al., 2019, p. 5).

Furthermore, a lack of leadership support for HHRIs is often perceived as a barrier for SUD care, often leading to confusion, ambiguity, lack of knowledge, and feelings of opposition amongst healthcare professionals (van Boekel et al., 2013). Findings suggest that “hospital leaders’ decisions, actions, and attention are critical to supporting evidence-based, nondiscriminatory care for people with SUD” (Englander et al., 2020, p. 7). Moreover, formal policy changes convey the expectations of HHRI support through consistent recruitment and retention practices, new employee training, systemwide mandatory education for healthcare team members, and through mentoring by senior staff (Hyshka et al., 2019). Therefore, leadership buy-in, stakeholder engagement, and formal policy changes concerning HHRIs can improve SUD patient outcomes and experiences while simultaneously decreasing stigma and systemic biases.

A paucity of in-hospital support for HHRIs is not the only perceived barrier for SUD patient care. Gaps between post-discharge follow-up care and follow-up with community-based SUD treatment programs are a growing concern for this vulnerable patient population (Hyshka et al., 2019; Thompson et al., 2020). Findings suggest that HHRIs (e.g., MFTs to manage withdrawal symptoms, ACSs) linked with post-discharge follow-up services (i.e., MFT clinics, peer support specialists) reduce SUD patient hospital length of stay and increase post-hospitalization SUD treatment compliance (Trowbridge et al., 2017; Thompson et al., 2020). In addition, Trowbridge et al. (2017) found that connecting SUD patients to on-going outpatient care is feasible and generalizable for most urban settings.

Limitations

There are several common limitations of the included studies which should be discussed to better contextualize the findings. First, the literature is limited to observational studies, qualitative research designs, retrospective analyses, and one randomized control study. Therefore, it is difficult to define a clear causal relationship between the explanatory variables (HHRIs) and the response variable (improved health outcomes for SUD patients). Forthcoming research of higher methodological quality is required to better appreciate the relationship between improved health outcomes and use of HHRIs. However, it is important to note the unethical nature of randomizing the SUD patient population with regards to treatment of opioid, alcohol, amphetamine, and benzodiazepine withdrawal symptoms; thus, future research may be restricted to observational studies.

Second, most of the studies were completed in environments with well-established harm reduction services. In addition, study environments are limited to one location suggesting single site limitations. This may limit generalizability as the findings may not be transferable to rural hospital settings that lack resources (e.g., funding, SUD specialists, leadership buy-in) imperative for implementation. Further studies should continue to investigate the feasibility of HHRIs in non-academic, rural, and frontier hospitals.

Third, some study designs have restricted outcome assessments which may challenge the efficacy and validity of select hospital-based harm reduction treatments (i.e., long-term success rates of MFTs for OUD). Studies contribute limited follow-up completeness to short-term follow-up periods (30 to 180-day post hospital discharge), and reduced participant follow-up rates due to common biopsychosocial factors of the SUD patient population: homelessness, accessibility to care, and racial disparities. These factors should be considered when designing future studies. Longitudinal designs may yield better outcome assessments, strengthening the validity of the aforementioned interventions. Federal, state, and city policies and practices addressing people experiencing homelessness and SUDs should be implemented with urgency.

Noted are the intrinsic limitations within this paper. Though the literature was systematically searched, it is possible that relevant studies were excluded or not found, and publication bias may be present as this paper can only review the research that has been published. In addition, search results were limited only to the English language which, consequentially, excluded the literature published in languages of countries that commonly employ harm reduction approaches to their policies and practices.

Clinical Implications

Despite the limitations, this review has important implications for integrating harm reduction interventions within inpatient and outpatient healthcare systems. To address the complex care and treatment of SUD patients, organizational policy change will be needed to support HHRIs. With the assistance of health professionals, regulatory bodies such as the Centers for Disease Control and Prevention (CDC), Centers for Medicare and Medicaid Services (CMS), Canadian Society for Addiction Medicine (CSAM), and state-level departments of health will be required to update their abstinence-based clinical practices and policies; thus, reflecting the harm reduction model's evidence-based guidelines and expert opinions on SUD care. These policy and practice changes may reduce negative health outcomes of the SUD patient population by emphasizing PCC; therefore, reducing stigma and improving overall quality of care (Hyshka et al., 2019; Nadelmann & LaSalle, 2017; Priest et al., 2020).

While integrating focused harm reduction methodologies into acute care hospital policies and practices has the potential to improve negative health outcomes, a more focused approach, such as specialized hospital SUD units, may promote PCC and decrease adverse patient outcomes (McNeil et al., 2016; van Boekel et al., 2013). Specialized SUD units may provide a necessary culture of safety for not only this patient population, but for the healthcare professionals that work in the setting. Research has shown that health professionals who work with SUD patients on a more consistent basis express less perceived biases and more tolerance

for this patient population (van Boekel et al., 2013). An acute care hospital would have to provide the resources and education for healthcare providers through the lens of harm reduction principles.

Hospitalizations present unique socio-emotional challenges to the SUD patient population. Peer support specialist provide *sponsorship* by utilizing harm reduction principles and strategies to advocate, support, and educate SUD patients from onset of withdrawal symptoms at hospital admittance through treatment options at hospital discharge. Peer supporters meet patients where they are at on the recovery spectrum. Their aim is to de-stigmatize the SUD patient population and drug use, as well as, to manage the compulsion to use, emotional pain, and other unique needs of SUD patients through MI. Studies have shown that the integration of peer support specialists into acute hospital settings have improved the SUD patient-provider relationship whilst reducing stigma and implicit biases aimed at this marginalized population (Velez et al., 2016; Hyshka et al., 2019).

Moreover, peer support specialists keep SUD patients engaged in care once they leave the hospital. They provide a link to a variety of outpatient services (i.e., resources for SUD patients with food insecurities, transportation to methadone clinics) for SUD patients. This bridge to outpatient services is the source of engagement that improves negative health outcomes for this vulnerable community (Wakeman et al., 2017).

Conclusion

This review provides insight into the challenges related to HHRI development, implementation, and sustainability. The findings suggests that HHRIs are a useful treatment option to manage the unique needs associated with the growing SUD patient population. HHRIs represent a promising approach to improve SUD patient health outcomes, reduce stigma, and help hospital systems address the current and future comprehensive issues related to SUD.

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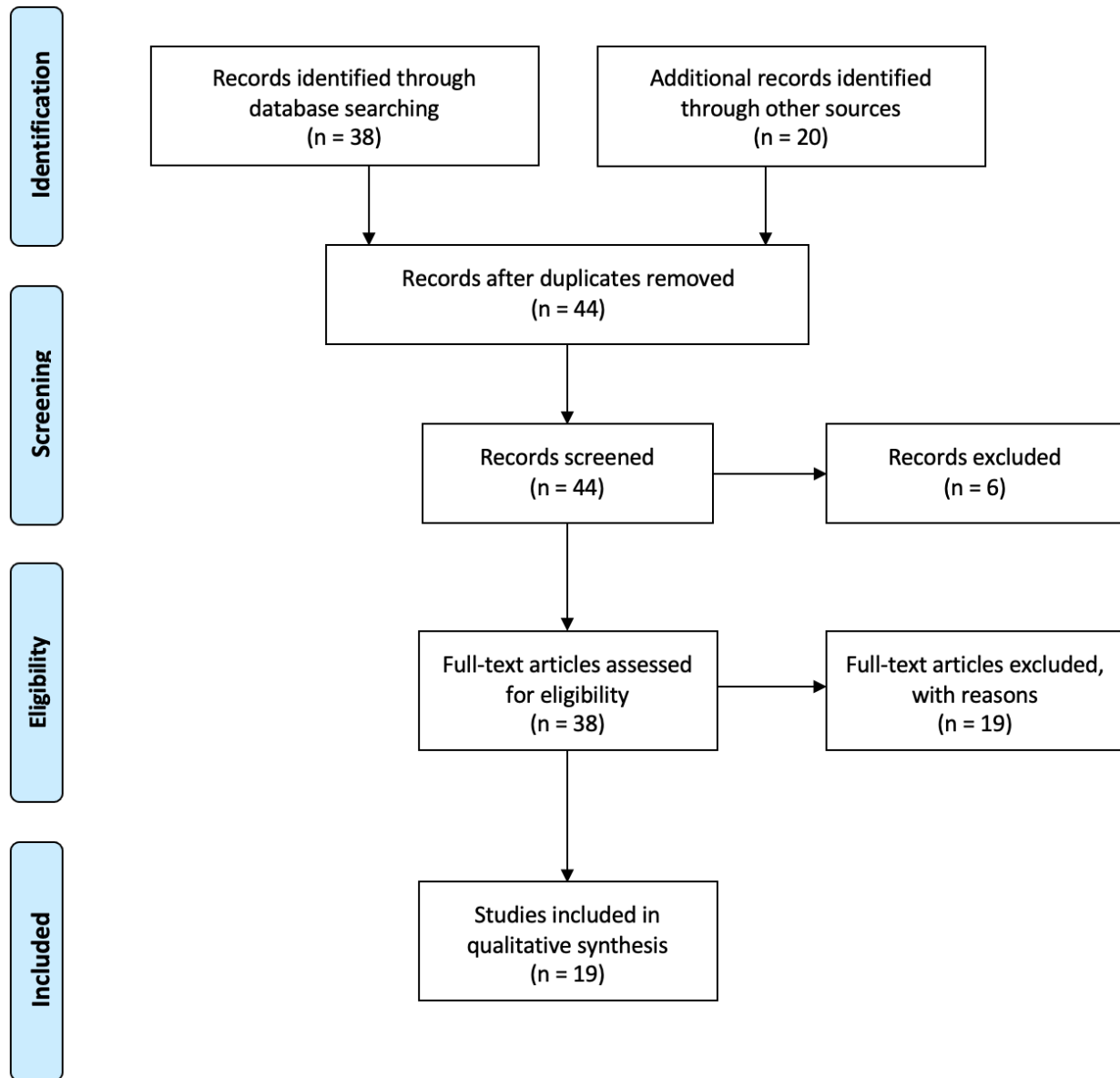
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Appendix A

PRISMA 2009 Flow Diagram



From "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement," by Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group 2009, *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097. Copyright 2009 by The PRISMA Group.

Appendix B

Table of Evidence

Article	Author, year	Aim	Research Design	Population/Sample	Outcome	Time
1	Capizzi, J., Leahy, J., Wheelock, H., Garcia, J., Strnad, L., Sikka, M., Englander, H., Thomas, A., Korthuis, P., & Menza, T. (2020)	To determine the increase of bacterial infections (both serious and non-serious) amongst people with OUD/SUD and the subsequent cost of treatment for this patient population.	Cohort study	4,084,743 hospitalizations among 2,090,359 SUD patients	Hospitalizations increased from 0.26% to 1.68% (P<0.001): bacteremia/sepsis rose most rapidly with an 18-fold increase. Overall, the total cost of hospitalizations increased from \$16,305,129 in 2008 to \$150,879,237 in 2018 (P<0.001).	1/2008-12/2018
2	Cortina, S., Kennedy, M., Dong, H., Fairbairn, N., Hayashi, K., Milloy, M., & Kerr, T. (2018)	To examine factors associated with willingness to use an in-hospital supervised inhalation room among people who smoke crack cocaine in Vancouver, Canada.	Cross-sectional design	539 SUD patients	59.4% reported willingness to use an in-hospital supervised inhalation room highlighting potential of supervised inhalation rooms to complement existing in-hospital services for PWUD.	6/2013-5/2014
3	Englander, H., Patten, A., Lockard, R., Muller, M., & Gregg, J. (2020)	Assess the feasibility, acceptability, and effects of ECHO and explore lessons learned and implications for the spread of hospital-based addictions care.	Mixed-methods study .	143 hospital providers and administrators in the State of Oregon	67.1% of participants were highly satisfied with ECHO and more prepared to treat SUD.	1/2019-1/2020
4	Hawk, M., Coulter, R. S., Egan, J. E., Fisk, S., Reuel, Friedman, M., Tula, M., & Kinsky, S. (2017)	To understand how harm reduction was operationalized in a clinic setting, and to apply this data and principles of harm reduction to healthcare settings	Qualitative inquiry & research design	23 SUD patients and 17 staff members of a HIV clinic	Six principles of harm reduction for acute hospital setting: humanism, pragmatism, individualism, autonomy, incrementalism, and accountability without termination.	2016
5	Hyshka, E., Morris, H., Anderson-Baron, J., Nixon, L., Dong, K., & Salvalaggio, G. (2019)	To address the gap in research on the implementation of an ACS in acute care hospitals.	Qualitative inquiry & research design	21 SUD patients	ACS led to better hospital experiences and perceived outcomes for SUD patients.	6/2015-5/2016

6	Martino, S., Zimbrea, P., Forray, A., Kaufman, J. S., Desan, P. H., Olmstead, T. A., Gilstad-Hayden, K., Gueorguieva, R., & Yonkers, K. A. (2019)	To determine the effectiveness of three strategies for implementing motivational interviewing for substance misuse with general medical inpatients.	RCT	38 providers (physicians, PAs, and RNs), and 1173 SUD patients admitted to acute care hospital	Patients who received MI from the ACS favored reducing substance misuse when compared to those patients who did not receive MI from the ACS.	2/2013-8/2017
7	McNeil, R., Kerr, T., Pauly, B., Wood, E., & Small, W. (2016)	To explore the perspectives of PWUD regarding integration of harm reduction interventions into hospitals; and, implications of these interventions for PCC, hospital outcomes, and drug-related risks and harms.	Qualitative inquiry & research design	30 PWUD who discharged from a hospital AMA in last two years, and had multiple hospitalizations in last five years	Hospital-based harm reduction interventions for PWUD can potentially improve hospital care retention, promote PCC, and increase positive health outcomes.	12/2011-2/2013
8	Nadelmann, E., & LaSalle, L. (2017)	To discuss the barriers for implementing harm reduction interventions within the U.S. compared to Western Europe and other regions.	Practice guidelines	NA	Ideological resistance to harm reduction is fading in the US. The U.S. lags behind Europe, Australia, and Canada in implementing harm reduction interventions.	NA
9	Priest, K.C., Englander, H., & McCarty, D. (2020)	To examine specific facilitators and barriers to developing, implementing, and operating ACS in well-resourced U.S. hospitals.	Qualitative inquiry & research design	17 board-certified or board-eligible addiction physicians	Six themes that promoted or inhibited ACS development and operations identified.	NA
10	Raven, M. C., Doran, K. M., Kostrowski, S., Gillespie, C. C., & Elbel, B. D. (2011)	To pilot a novel patient-centered intervention for high-risk patients with frequent hospital admissions to determine its potential to improve care and reduce costs.	Cohort study	19 SUD patients with 64 inpatient admissions to an urban acute care hospital	Patients had a total of 64 inpatient admissions in the 12 months before the intervention, versus 40 in the following 12 months, a 37.5% reduction. 73.3% had fewer inpatient admissions in the year after the intervention compared to the prior year.	NA
11	Shanahan, C. W., Beers, D., Alford, D. P., Brigandi, E., & Samet, J. H. (2010)	To identify and link OUD patients to addiction treatment while hospitalized.	Cohort study	203 people with OUD	OUD patients in acute care hospitals presented with ORT, PCC, MI, and principles of harm reduction were engaged in addiction treatment.	1/2002-1/2005

12	Sharma, M., Lamba, W., Cauderella, A., Guimond, T. H., & Bayoumi, A. M. (2017)	To outline harm reduction practices for implementation in acute care hospital settings.	Practice guidelines	NA	Evidence is strong for harm reduction interventions to increase positive health outcomes; further research is needed to integrate harm reduction strategies into acute care hospital settings	NA
13	Thompson, H. M., Faig, W., VanKim, N. A., Sharma, B., Afshar, M., & Karnik, N. S. (2020)	To determine if an ACS is effective at reducing SUD patient length of stay in an acute care hospital, decrease AMA discharges amongst this patient population, and improve health outcomes.	Cohort study	1,900 SUD patients	Length of stay was shorter among encounters with a SUD that received an ACS consultation (e.g., Substance Use Intervention Team) versus those admissions that did not receive one (5.77 v. 6.54 days, $p < 0.01$).	2018
14	Ti, Lianping, Ti, Lianlian. (2015)	To examine the phenomena of SUD patients leaving acute care hospitals AMA, and identify potential methods to minimize these occurrences.	Systematic review	17 studies	AMA prevalence is 25-30%; factors positively associated with leaving AMA include injection drug use. Negatively affected this outcome include ORT, social support, and post-discharge follow-up.	1977-2014
15	Trowbridge, P., Weinstein, Z. M., Kerensky, T., Roy, P., Regan, D., Samet, J. H., & Walley, A. Y. (2017)	To describe the implementation of an ACS at Boston Medical Center, and rates of success for their ORT clinic.	Cohort study	337 SUD patients	For methadone, 76% linked to methadone clinic, with 54%, 39%, and 29% still retained at 30, 90, and 180 days, respectively. For buprenorphine, 49% linked to clinic, with 39%, 27%, and 18% retained at 30, 90, and 180 days For naltrexone, 26% linked to clinic, all with alcohol UD alone.	7/2015-1/2016
16	van Boekel, L. C., Brouwers, E. P., van Weeghel, J., & Garretsen, H. F. (2013)	To assess health professionals' attitudes towards patients with SUDs, and examine the consequences of these attitudes on healthcare delivery.	Systematic review	28 studies	Negative attitudes (i.e., stigma) of health professionals towards SUD patients are common, and contribute to negative health outcomes.	2000-2011

17	Velez, C.M., Nicolaidis, C., Korthuis, P.T., Englander, H. (2016)	To explore the experiences of hospitalized adults with SUD and to better understand patient and system level factors impacting readiness for change.	Qualitative inquiry & research design	32 SUD patients	Mortality was motivation for change and hospitalization disrupted substance use. Patients experience trauma, homelessness, and chronic pain, and appreciate providers who have experience treating SUD, choice of harm reduction treatment.	9/2014-5/2015
18	Wakeman, S. E., Metlay, J. P., Chang, Y., Herman, G. E., & Rigotti, N. A. (2017)	To determine whether inpatient addiction consultation improves substance use outcomes one month after discharge.	Quasi-experimental design	399 SUD patients	ACS reduced addiction severity for alcohol and drug use, and increased the number of days of abstinence in the first month after hospital discharge.	4/2015-4/2016
19	Wei, J., Defries, T., Lozada, M., Young, N., Huen, W., & Tulskey, J. (2014)	To implement and evaluate a discharge planning protocol for patients admitted with alcohol dependence.	Case control study	292 SUD patients	Rates of MFT increased from 0 % to 64 % (p value <0.001). All-cause 30-day readmission rates decreased from 23.4 % to 8.2 % (p value=0.042). All cause emergency department visits within 30 days of discharge decreased from 18.8 % to 6.1 % (p value=0.056).	6/2011-3/2012

Note. Abbreviations: PWUD (people who use drugs), ORT (opioid replacement therapy), RCT (randomized control trial), PA (physician assistant), RN (registered nurse), and NA (not applicable).

Appendix C

Clinical Opiate Withdrawal Scale

For each item, circle the number that best describes the patient's signs or symptom. Rate on just the apparent relationship to opiate withdrawal. For example, if heart rate is increased because the patient was jogging just prior to assessment, the increase pulse rate would not add to the score.

Patient's Name: _____		Date and Time ____/____/____:_____	
Reason for this assessment: _____			
Resting Pulse Rate: _____beats/minute <i>Measured after patient is sitting or lying for one minute</i> 0 pulse rate 80 or below 1 pulse rate 81-100 2 pulse rate 101-120 4 pulse rate greater than 120		GI Upset: over last 1/2 hour 0 no GI symptoms 1 stomach cramps 2 nausea or loose stool 3 vomiting or diarrhea 5 multiple episodes of diarrhea or vomiting	
Sweating: over past 1/2 hour not accounted for by room temperature or patient activity. 0 no report of chills or flushing 1 subjective report of chills or flushing 2 flushed or observable moistness on face 3 beads of sweat on brow or face 4 sweat streaming off face		Tremor observation of outstretched hands 0 no tremor 1 tremor can be felt, but not observed 2 slight tremor observable 4 gross tremor or muscle twitching	
Restlessness Observation during assessment 0 able to sit still 1 reports difficulty sitting still, but is able to do so 3 frequent shifting or extraneous movements of legs/arms 5 unable to sit still for more than a few seconds		Yawning Observation during assessment 0 no yawning 1 yawning once or twice during assessment 2 yawning three or more times during assessment 4 yawning several times/minute	
Pupil size 0 pupils pinned or normal size for room light 1 pupils possibly larger than normal for room light 2 pupils moderately dilated 5 pupils so dilated that only the rim of the iris is visible		Anxiety or Irritability 0 none 1 patient reports increasing irritability or anxiousness 2 patient obviously irritable or anxious 4 patient so irritable or anxious that participation in the assessment is difficult	
Bone or Joint aches <i>If patient was having pain previously, only the additional component attributed to opiates withdrawal is scored</i> 0 not present 1 mild diffuse discomfort 2 patient reports severe diffuse aching of joints/muscles 4 patient is rubbing joints or muscles and is unable to sit still because of discomfort		Gooseflesh skin 0 skin is smooth 3 piloerection of skin can be felt or hairs standing up on arms 5 prominent piloerection	
Runny nose or tearing <i>Not accounted for by cold symptoms or allergies</i> 0 not present 1 nasal stuffiness or unusually moist eyes 2 nose running or tearing 4 nose constantly running or tears streaming down cheeks		Total Score _____ The total score is the sum of all 11 items	
		Initials of person completing assessment: _____	

Score: 5-12 = mild; 13-24 = moderate; 25-36 = moderately severe; more than 36 = severe withdrawal

Note. From "The Clinical Opiate Withdrawal Scale (COWS)," by D. Wesson & W. Ling, 2003, *Journal of Psychoactive Drugs*, 35(2), p. 259.