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A systematic review of crisis interventions used in the emergency department: recommendations for pediatric care and research

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Abstract

Objective—In this systematic review we evaluated the effectiveness of emergency department (ED)-based management interventions for mental health presentations with an aim to provide recommendations for pediatric care.

Methods—A search of electronic databases, references, key journals and conference proceedings was conducted and primary authors contacted. Experimental and observational studies that evaluated ED crisis care with pediatric and adult patients were included. Adult-based studies were evaluated for potential translation to pediatric investigation. Pharmacological-based studies were excluded. Inclusion screening, study selection, and methodological quality were assessed by two

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independent reviewers. One reviewer extracted the data and a second checked for completeness and accuracy. Presentation of study outcomes included odds ratios (OR) and mean differences (MD) with 95% confidence intervals (CI). Meta-analysis was deferred due to clinical heterogeneity in intervention, patient population, and outcome.

Results—Twelve observational studies were included in the review with pediatric (n=3), and adult or unknown (n=9) aged participants. Pediatric studies supported the use of specialized care models to reduce hospitalization (OR=0.45; 95% CI:0.33,0.60), return ED visits (OR=0.60, 95% CI:0.28,1.25), and length of ED stay (MD=−43.1min; 95% CI:−63.088,−23.11). In an adult study, reduced hospitalization was reported in a comparison of a crisis intervention team to standard care (OR=0.59; 95% CI:0.43,0.82). Five adult-based studies assessed triage scales; however, little overlap in the scales investigated and the outcomes measured limited comparability and generalizability for pediatrics. In a comparison of a mental health scale to a national standard, one study demonstrated reduced ED wait (MD=−7.7 min; 95% CI:−12.82,−2.58) and transit (MD=−17.5 min; 95% CI:−33.00,−1.20) times. Several studies reported a shift in triage scores of psychiatric patients dependent on the scale or nurse training (psychiatric vs. emergency), but linkage to system- or patient-based outcomes was not made limiting clinical interpretation.

Conclusions—Pediatric studies have demonstrated that the use of specialized care models for mental health care can reduce hospitalization, return ED visits, and length of ED stay. Evaluation of these models using more rigorous study designs and the inclusion of patient-based outcomes will improve this evidence base. Adult-based studies provided recommendations for pediatric research including a focus on triage and restraint use.

Keywords

mental health services; crisis; emergency care

Introduction

The prevalence of mental illness among Canadian and American children and youth is estimated between 15 and 20%, and recent projections suggest that this will see a 50% increase by the year 2020. Pediatric mental health emergencies pose a significant challenge to those tasked with providing care. At a time when prevalence is increasing, the resources available to appropriately address these concerns are declining, leaving both patients and care providers in a difficult situation. Emergency department (ED) visits for pediatric mental health account for 1.6% of visits in the United States, and increases in these visits have been considered disproportionate to increases in visits for other chronic diseases. A recently published Canadian study estimated that pediatric mental health accounts for 1% of all ED visits, with a noted 15% increase in presentations from 2002 to 2006. It has been proposed that a lack of community-based services, as well as the fragmentation of and limited access to these services, has led to the use of the ED for routine mental health care; however, this usage has been challenged by limited ED capacity and there remains an outstanding need to develop mechanisms that promote optimal ED care. While some jurisdictions have developed urgent community-based clinics and mobile mental health teams to address these issues, it remains that the ED is easier to access in a timely fashion in times of crisis.

Although early intervention and long-term community-based management is the ideal for a child or youth with mental health needs, the emergency management and treatment received in times of crisis or acute illness exacerbation is also a vital part of care. In 2006, the American Academy of Pediatrics and the American College of Emergency Physicians issued a joint policy statement that children with acute mental health crises require multidisciplinary care, including the use of specialized screening tools, pediatric-trained mental health consultants, broader availability of treatment options, and communication throughout the health care system. These recommended resources, however, remain rare in the ED. A greater degree of direction is available for ED clinicians in cases with a readily apparent diagnosis (e.g., self harm,) or a coexisting serious medical issue (i.e., overdose), but there is less guidance when the presenting complaint is non-urgent. In this systematic review we evaluated the effectiveness of ED-based management interventions for mental health presentations. Both adult and pediatric literature was reviewed with the overall aim of providing recommendations for pediatric care and future research.

Materials and Methods

Search Strategy

A research librarian, with input from the clinical research team, developed and implemented systematic search strategies using language (English and French) and year (1985 to 2009) restrictions. This review is part of a series of reviews aimed at examining available evidence for pediatric emergency mental health care; therefore, a much broader search strategy was initially used to identify all relevant ED-based mental health studies. More focused screening strategies were employed after the initial search to identify review relevant studies. The search was conducted in 14 high yield electronic databases: MEDLINE®, Ovid MEDLINE® In-Process & Other Non-Indexed Citations, EMBASE, Cochrane Central Register of Controlled Trials, OVID HealthStar, Cochrane Database of Systematic Reviews, Health Technology Assessment Database, Database of Abstracts of Reviews of Effects, ACP Journal Club, PsycINFO®, CINAHL®, SocIndex, ProQuest Theses and Dissertations, and Child Welfare Information Gateway. To identify unpublished studies and studies-in-progress, we searched ClinicalTrials.gov and contacted authors of relevant studies. Reference lists, key journals, and conference proceedings (Canadian Association of Emergency Physicians, Society for Academic Emergency Medicine, American College of Emergency Physicians, Canadian Paediatric Society) were also reviewed. The initial search was conducted in January 2008 and was updated in March 2009. Comprehensive strategies used in each database are available from the corresponding author upon request.

Study Selection

Two reviewers independently screened the search results. Experimental and observational studies were eligible for review inclusion. Studies that included children and youth (18 years) or adults (>18 years) presenting to the ED with a primary complaint related to mental health were included. Adult-based studies were included and evaluated for potential translation to pediatrics. Study samples that were heterogeneous in mental health diagnosis/need were included as long as patients received the ED-based mental health care under evaluation. This care could include any intervention designed to assess, treat, and/or

therapeutically support or manage mental health presentations. Studies evaluating the efficacy or effectiveness of pharmacological interventions were excluded from the review. Study outcomes of interest included changes in patient health or behaviour, changes in ED-practice delivery, and cost.

Quality Assessment

All studies included in the review were observational in design and were assessed using methodological criteria developed by Downs and Black. Quality was measured by study reporting, external and internal validity, and power, with a maximal quality index (QI) of 29. QI scores of >20 were considered good, 11 to 20 moderate, and <11 poor. Two reviewers independently analyzed each study's methodological quality and agreement was quantified with the Kappa statistic.

Data Extraction and Analysis

Data were extracted using a standardized form that encompassed elements of study characteristics (e.g., language of publication, country); characteristics of the study population (including whether studies used the ICD-10 or DSM diagnostic system, for diagnostic identification); description of the intervention and comparisons; outcome measures and measurement tools; and results. Data were extracted by one reviewer and checked for accuracy and completeness by a second reviewer. Discrepancies were resolved by consensus. In the case of unclear or unreported information in the original studies, primary authors were contacted. Heterogeneity in clinical population, interventions, and outcomes precluded the use of meta-analysis to pool and interpret study results; therefore, a descriptive analysis of review findings is presented with studies grouped according to patient age (<18 years; ≥18 years and unknown) and intervention type. Missing study data limited interpretation. To provide clinical meaning to outcome reporting, when data were available, we calculated unadjusted odds ratios (OR) with 95% confidence intervals (95%CI) for dichotomous outcomes and mean differences (MD) with 95%CI for continuous outcomes (StatsDirect Ltd., 2002). Study reported data (i.e., means, standard deviations [SDs], frequencies) were extracted when independent calculations were not possible.

Results

Description of Studies

We identified 1,567 potentially relevant articles from the electronic databases and hand search, of which 123 full manuscripts were reviewed for inclusion. Twelve studies published in thirteen papers met the criteria for inclusion in the review (see Figure 1). Study characteristics are presented in Table 1. All studies were published in English and publication dates ranged from 1988 to 2009 (median year 2003). Most studies (n=7) were conducted in North America; three of the five studies of triage scales were conducted in Australia. Studies included pediatric (n=3) and adult or unknown (n=9) aged participants. All studies included a range of mental health presentations (see Table 1).

Methodological Quality of Studies

Study designs were all observational and included prospective cohort,– controlled before–after,– uncontrolled before–after,– and interrupted time series designs (see Table 1). Individual study quality ranged from good (scores of 22/29– and 25/29) to moderate (scores ranging from 14 to 19 out of 29–,–). No studies were rated as poor in quality (QI score <11/29). Inter-rater agreement on quality assessment was high ($\kappa=.80$). Common limitations across the studies were the failure to account for potential confounders, the use of a non-representative study population, inconsistency in compliance with the intervention, and unclear use of statistics. The implications of these limitations are discussed later in this paper.

Description of Interventions and Outcomes

There was heterogeneity in populations studied (pediatric, adult, unknown), outcomes measured, and interventions implemented. Of the twelve studies, six examined the impact of specialized models of care.,– Three studies–, were conducted with a pediatric population and included the examination of referrals to a specialized team consisting of, at minimum, a child psychiatrist with– or without other psychiatric professionals (i.e., nurse specialist or social worker). There was minimal overlap in outcomes which included length of stay,, rate of hospital admission,, and cost analysis. Three adult-based studies explored the referral patterns of psychiatrists and psychologists following legislative changes and the impact of general crisis intervention teams compared to standard ED care, on disposition– and patient distress. Six studies examined the impact of tools or strategies designed to assist in the assessment and management of patients (adult or unknown age) with a range of psychiatric concerns.–,– Five of these six studies investigated approaches to patient triage.–,– Length of stay,– triage category,– confidence, disposition and follow-up characteristics, were measured. The sixth study examined the impact of a computerized reminder system on restraint order renewal.

Effects of Specialized Models of Pediatric Care

As shown in Table 2, the availability of a psychiatric team in the ED for pediatric mental health presentations was associated with a reduction in hospital admissions when compared to standard ED care., Greenfield et al. reported a decrease in hospitalization (OR=0.45; 95%CI:0.33,0.60) and ED returns (OR=0.60; 95%CI:0.28,1.25) following the implementation of an ED follow-up team, while Parker et al. saw mean monthly inpatient admissions from the ED drop from 6.3 (SD 2.5) to 2.3 (SD 1.3) following the implementation of a rapid response model for emergency mental health care. Length of ED stay was reduced significantly following the introduction of a child guidance model (MD= –43.1 min; 95%CI:–63.088,–23.11). This decrease was accompanied by a modest cost savings in the ED of \$10,651 (based on US dollars in 2002) over a six month period.

Effects of Patient Triage Scales

Five studies with adult or unknown clinical populations evaluated four triage scales for mental health presentations: (1) National Triage Scale (NTS), (2) Mental Health Triage Scale (MHTS), (3) Canadian Triage and Acuity Scale (CTAS), and (4) a two-stage medical/

psychiatric triage system (see Table 3). ED wait (MD=-7.7 min; 95%CI:-12.82,-2.58) and transit (MD=-17.5 min; 95%CI:-33.00,-1.20) times were reduced using the MHTS when compared the NTS. A separate study, however, found significant discordance ($\kappa=0.029$) in the use of the MHTS by psychiatric nurses versus ED triage nurses— with triage nurses consistently ranking patients as in more urgent need of care compared to psychiatric nurses. A re-designed MHTS using five categories that could be integrated into the NTS by non-mental health educated nurses improved confidence in triaging mental health patients (pre-adoption confidence: 0% vs. 18.5% post-adoption confidence). Both Broadbent and Hapell— reported a shift to less urgent triage scores for psychiatric patients dependent on the scale or nurse training (psychiatric vs. emergency),— but linkage to system- or patient-based outcomes was not made. A Canadian study implementing an educational session for triage nurses based on the CTAS and MHTS also reported a shift in triage scores, but changes in length of ED stay or admission/discharge rates were not significantly reduced. An increase in patients who left without being seen (LWBS) was reported after implementation of the educational session (OR=2.41; 95%CI:0.81, 8.04); however, differences in LWBS classification between mental health and medical ED staff make interpretation of this finding difficult. A two-stage medical/psychiatric triage system using mental health crisis counselors compared to a traditional triage model also reduced wait times (53.09 min [SD 47.55] vs. 73.32 min [SD 59.67]), the number of patients who left against medical advice (1.18% vs. 3.16%; $p=0.084$), critical security incidents (16.34% vs. 23.79%), and admissions (57 vs. 277); however, missing sample size data make interpretations difficult.

Effects of Other ED Mental Health Care

As shown in Table 4, three additional approaches to care were evaluated with adult or unknown aged clinical populations. The introduction of legislation changing ED psychiatric consultation processes (namely allowing psychologists to recommend involuntary patient hospitalization and broadening of the definition of ‘likelihood of harm’) did not result in different disposition decisions made by psychologists (OR=1.00; 95%CI:0.88,1.13) or between psychiatrists and psychologists (OR=1.10; 95%CI:0.97,1.25). The evaluation of two crisis-based management models focused on different outcomes. Compared to standard care, a multidisciplinary crisis team did not result in different levels of patient distress, while crisis intervention by a medical team decreased patient hospitalization (OR=0.59; 95%CI:0.43,0.82). In their evaluation of a computerized reminder system for restraints, Griffey et al. found time to renewal of restraint orders was reduced after the implementation of a ‘soft-stop,’ passive prompt for renewal (125 min vs. 189 min) and a ‘hard-stop,’ forced renewal (133 min vs. 189 min) when compared to standard ED care. Patient time spent in restraints also decreased through the use of the ‘hard-stop’ renewal versus standard care (130 min vs. 235 min). There was no difference in renewal time or time spent in restraints between the ‘soft-stop’ and ‘hard-stop’ approaches.

Discussion

Among the greatest challenges in pediatric emergency mental health care is determining whether models of assessment, treatment, and management are beneficial. Inherent in this

task is determining which outcomes ‘matter’. Of the three studies conducted in pediatric populations, all were focused on health systems outcomes. Each study assessed various models of care utilizing a specialized child psychiatry team so as to introduce organization and facilitate flow through the ED, and each study reported a positive impact on the outcomes measured. However, without appropriately measuring health care provider- and patient-centered outcomes, understanding the degree to which these models impact patient functioning, quality of service delivery, and provider/patient satisfaction is restricted and thus limits clinical applicability. While the nature of ED care necessitates a high level of efficiency, important outcomes from a health services perspective (i.e., admission rate or time to discharge) are not necessarily viewed as priorities by patients, their families, or ED care providers. Only one adult-based study measured the impact of specialized care on patient distress and found no significant difference between the specialized approach and standard care. Further, although decreased hospitalization rates reported by several studies may be an indication of a shift in resource use, future investigations should include an examination of discharge planning and post-ED service use to evaluate the role and impact of ED-based care on the continuum of mental health care. Longitudinal studies, for example, could provide a detailed description of how and where patients are referred, and could be more informative in guiding clinicians in the best strategies to use with their pediatric patients prior to ED discharge.

Of the crisis intervention teams and psychiatric models of care examined in both general and pediatric populations, significant reductions in return ED visits, length of ED stay, and cost savings were reported. Whether EDs alone, or in partnership with mental health programs, are currently implementing any of these specialized emergency mental health services for pediatric care based on these findings, however, is unknown. There are no available statistics on the number of EDs in the US or Canada offering specialized services, and whether the EDs that do offer these services track health care utilization and costing data is also unknown. Despite promising study findings, our review has demonstrated that further evaluation of specialized service models is needed in pediatrics prior to widespread implementation of any model/program. Future studies should be based on more rigorous, experimental study designs so as to reduce risk of bias during study conduct and increase the ability to detect true ‘intervention effects’. Of the studies included in our review, many did not account for potential confounders that could have impacted study outcomes. These confounders include, but are not limited to, ED patient census at the time of presentation, patient co-morbidities, co-interventions, inpatient bed availability, and years of clinician experience. Future studies also need to clearly define study populations from a diagnostic or clinical care perspective and evaluate intervention adherence. This latter focus will allow for an accurate assessment of feasibility and functionality of the specialized service model in ED settings.

By including both pediatric and adult studies in this systematic review, we were able to determine whether strategies shown effective in adult populations could be evaluated for use in pediatrics. The majority of adult studies examined the effectiveness of triage scales for mental health, which has not yet been considered in the pediatric literature but could be readily evaluated. In 2008, for example, the Canadian Emergency Department Triage and Acuity Scale (CTAS) was revised to address a wider range of adult mental health complaints

and this system of categorization is considered relevant in triaging pediatric patients with modifications made to also include behavioural disorders specific to children and youth (i.e., autism spectrum disorders, attention deficit disorder). The CTAS has been investigated via an educational program in one study, which could be translated into the pediatric setting. The ability to extrapolate findings to pediatrics may not hold true for the two Australian Mental Health Triage Scales,–, which were developed for a defined geographical area, or the population health triage scale, which addresses issues potentially less relevant in pediatric mental health than in adults. More discussion and evaluation may be needed before these triage tools are ready for pediatric application and evaluation. Further, if these tools are to be assessed for valid application in the pediatric ED, careful consideration should also be given to outcome measures. In the current triage-based studies, there was little overlap in the outcomes measured across studies and linkage to system- or patient-based outcomes was not made, limiting clinical interpretation.

Another area of focus in one adult-based study was physical restraint. Its study in pediatrics is warranted—while this form of restraint is used in fewer than 5% of pediatric psychiatric patients, formal policies are common and it is unclear whether these policies are evidence-based. Given that no pediatric emergency research studies were retrieved regarding the use of restraints with children and youth, evidence for effective use appears lacking. In a survey of 118 emergency medicine residencies and 50 pediatric emergency medicine fellowships, 52–82% of respondents indicated that education is not provided at their institution on how to properly apply restraint and 35–64% reported that appropriate situations for restraint use are not taught. Increasing education- and intervention-based research in this area could impact a number of system and patient outcomes including health care provider competency and service delivery, patient symptomatology and satisfaction, as well as ED length of stay, ancillary resource use, and costs.

While patient satisfaction was not measured by studies included in this review, caregiver satisfaction and level of confidence was assessed by Broadbent et al. Lack of education and experience in managing mental health presentations is known to be a barrier for optimal care. In the Broadbent study, nurses who were provided with some education related to the assessment and management of psychiatric concerns reported an increase in confidence in clinical skills. The quality of care provided, however, was not assessed. Happell et al.– found that triage nurses and psychiatric nurses consistently differed in their perceptions of the urgency of these presentations with triage nurses rating patients as being in more urgent need of attention. Although not directly evaluated, anecdotal evidence indicates that educational programs are met with enthusiasm by the nursing staff suggesting that future pediatric studies of interventions for care providers may find success with this strategy.

Limitations

The limitations of this systematic review relate to the studies themselves. While the number of psychiatric visits to EDs is increasing for children and youth,– very few studies have evaluated pediatric models of care to address this growing need. Of the studies that have been conducted, limitations including methodologic and clinical heterogeneity as well as missing data precluded comprehensive between-study comparisons. The inconsistency in

studied management models and outcomes suggests that this is an area of research requiring maturation and refinement. Importantly, studies of experimental design need to be conducted to rigorously evaluate care effectiveness, and the inclusion of outcomes that matter at both a system- and patient-level is required. Multi-setting research efforts with consistent, well-defined models of care alongside comprehensive outcomes to indicate 'success' in ED management will provide a more definitive evidence base to guide clinical practice.

Conclusion

Findings from this review align well with the American Academy of Pediatrics and the American College of Emergency Physicians recommendations to provide a clear directive for evidence-based care. While a small number of studies demonstrated that the use of specialized care models for pediatric emergency mental health care can impact service delivery and impact on the health care system, evaluation of these models using more rigorous approaches to study will improve confidence in this evidence base. Further, to address the reality of the available health care infrastructure, future pediatric emergency mental health research must determine the most relevant models of care in need of evaluation alongside the most relevant health care system and patient-centered outcomes in order to provide a relevant and workable evidence base.

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Figure 1.
Study inclusion process

Study Characteristics

Table 1

First Author (Country)	Study Design	Patient Population	Patient age range (y) M (SD)	Study Sample: Sample Size (n)
Pediatric Studies				
Mahajan (USA)	Uncontrolled before-after	Patients with an ICD (9 th revision) diagnosis for a mental disorder [‡]	0–19 12.5 (3.4)	Patients: Before (n=470), After (n=561)
Parker (Canada)	Interrupted time series	Patients requiring psychiatric consultation or admission [‡]	<19 NR	Patients: NR
Greenfield (Canada)	Uncontrolled before-after	Patients with a DSM-III psychiatric diagnosis ^{‡,§}	NR	Patients: Before (n=568), After (n=412)
Adult/Unknown Population Studies				
Griffey (USA)	Prospective cohort	Patients requiring restraint orders for psychiatric, substance use, or altered mental status presentations [‡]	IQR: 28–50 41.5 (16.6)	Patients: Intervention _B (n=41) Intervention _C (n=60) Control _A (n=38)
Vingilis (Canada)	Uncontrolled before-after	Patients with a psychiatric illness as the primary complaint [‡]	16–65 NR	Patients: NTD
Clarke (Canada)	Controlled before-after	Patients as identified by triage nurses as 'mental health' [‡]	NR	Patients: Before (n=158), After (n=138) Triage nurses: (n=17)
Damsa (Luxembourg)	Uncontrolled before-after	Patients admitted to the emergency psychiatric unit [‡]	NR	Patients: Before (n=563), After (n=644)
Happel (Australia),	Prospective cohort	Patients receiving treatment for personality disorder/adjustment disorder, anxiety, depression, substance use, or schizophrenia/psychosis	NR 34.3	Psychiatric nurse consultants: (n=2) Triage nurses: (n=40)
Broadbent (Australia)	Controlled before-after	Patients with a primary mental health complaint or associated issue [‡]	NR	Triage nurses: (n=23)
Smart (Australia)	Uncontrolled before-after	Patients presenting with a mental illness or disturbed behaviour, acute situational crises, or evidence of psychiatric disturbance [‡]	NR	Patients: Before (n=261), After (n=322)
Wood (USA)	Uncontrolled before-after	All patients requiring psychiatric evaluation [‡]	NR	Psychologists: Before (n=2,073), After (n=1,991) Psychiatrists: Before (n=2,309), After (n=1,966)
Spooren (Belgium)	Prospective cohort	Patients with psychiatric emergency referrals [‡] with a score 10 on the General Health Questionnaire	18–65 NR	Patients: Intervention (n=171), Control (n=37)

IQR: Interquartile range; NR: not recorded; NTD: not able to determine;

- † Spectrum of mental illnesses/disorders not defined;
- ‡ Population also included a proportion of 'other' (17%) presentations;
- § Population predominantly suicide-related presentations

Table 2

Impact of Specialized ED Models for Pediatric Mental Health Presentations

First Author	Primary Objective	Outcomes (primary, secondary)	Intervention (I) and Key Features	Comparison (C) and Key Features	Results (I vs. C)	Conclusion
Mahajan	To evaluate the impact of the child guidance model on visits for mental illness.	Primary: length of ED stay Secondary: cost of ED care	Child Guidance Model Features: - Referral to child guidance team (psychiatric social worker and child psychiatrist) for disposition decision-making	Standard Care Features: - Referral to a diverse group, including mental health screeners from individual insurance providers, social workers, psychiatrists	Length of stay: MD= -43.1 min; (95% CI: -63.088, -23.11) Cost savings: \$10,651.57 (USD)	A child guidance model decreased length of stay and reduced ED costs.
Parker	To describe the impact of the RRM in meeting the emergency needs of children and adolescents referred from the community.	Primary: inpatient admission from ED	RRM Features: - Immediate consultation with child psychiatrist or resident - Urgent consultation (reserved appointments) - Education	Standard Care Features: - not described	Admission from ED (monthly mean, SD): Baseline: 6.3 (2.5) 1 st RRM: 6.0 (2.6) Termination: 7.2 (3.2) 2 nd RRM: 2.3 (1.3) Reported overall effect: $p < 0.05$	The RRM reduced inpatient admissions from the ED.
Greenfield	To determine the impact of an outpatient psychiatric ERFUT on the hospitalization rate of youth in crisis.	Primary: hospitalization rate Secondary: return visit to ED	ERFUT Features: - Patient seen by clinical nurse specialist and child psychiatrist after assessment by ED psychiatric staff - Family and psychodynamically-oriented treatment	Standard Care Features: - Hospitalization or referral to outpatient follow-up	Hospitalization rate: OR= 0.45 (95% CI: 0.33, 0.60) Return to ED: OR= 0.60 (95% CI: 0.28, 1.25)	ERFUT reduced inpatient admissions in a population comprised mainly of suicidal children and adolescents. This reduction did not lead to less frequent return visits to the ED.

ERFUT: Emergency Room Follow-up Team; RRM: Rapid Response Model; USD: US dollars

Table 3

Impact of Patient Triage Approaches (Adult or Unknown Population)

First Author	Primary Objective	Outcomes (primary/secondary)	Intervention (I) and Key Features	Comparison (C) and Key Features	Results (I vs. C)	Conclusion
Vingilis	To evaluate use of a mental health triage and mental health crisis counselors for persons presenting with mental health concerns.	Primary: ED wait time, referral to services, critical security incidence, leaving against advice Secondary: emergency admission, police contact	Medical/Psychiatric Triage Program Features: - Triage 1: vital signs, medical assessment - Triage 2: population health (conducted by mental health crisis counselors)	Standard Care Features: - Traditional triage	Wait time (mean, SD): 53.09 min (47.55) vs. 73.32 min (59.67) $p<0.0001$ Referral: 64.44% vs. 62.86% $p=0.196$ Critical security incidence: 16.34% vs. 23.79% $p=0.002$ Left against advice: 1.18% vs. 3.16% $p=0.084$ Emergency admission (n): 57 vs. 277* Police contact (n): 5.962 vs. 8.027*	Triage and mental health crisis counselors reduced ED wait times and increase mental health referrals. They also reduced police contacts, emergency admissions and patients leaving against medical advice.
Clarke	To provide education and training to triage nurses regarding mental health and illness and monitor the transit of mental health patients through the ED.	Primary: length of ED stay, disposition, nurses' triage categorization	3-hour formal educational session for nurses Features: - Provision of practical clinical skills for assessing psychosis and suicidality - Structured on CTAS and MHTS	Standard Care Features: - Triaged prior to educational session	Length of stay: MD= -1.1 (95%CI: -2.82,0.62) Disposition: Admitted: OR= 0.97 (95% CI: 0.57,1.64) Discharged: OR= 0.93 (95% CI: 0.57,1.52) Left without being seen: OR= 2.41 (95% CI:0.81,8.04) Triage categorization: 2: 10.2% vs. 15.2%* 3: 31.9% vs. 30.4% 4: 45.7% vs. 45% 5: 7.2% vs. 8.9% * $p=0.000$	An educational and training session for nurses on mental illness and care reduced length of stay. This reduction, however, may have been related to other concurrent interventions. The percentage of patients triaged as 'not urgent' but required hospitalization was significantly reduced.
Happell-	To determine the degree of concordance between emergency triage nurses and specialist psychiatric nurse consultants in the use of the MHTS.	Primary: concordance between nurses' triage categorization	Rating given by psychiatric nurse consultant	Rating given by emergency triage nurse	Triage categorization: 2: 5.1% vs. 16.8% 3: 21.9% vs. 38.7% 4: 46.0% vs. 38.0% 5: 27.0% vs. 6.6% kappa=0.029	There was disagreement between emergency nurses and psychiatric nurse consultants in the triage of patients presenting for psychiatric related issues. Triage nurses rated patients in more urgent need of care than psychiatric nurses.
Broadbent	To develop and implement a triage scale (MHTS) that reflects mental health, substance abuse, and suicide risk issues.	Primary: nurses' level of confidence, perception of appropriateness of timeframe to care, triage categorization	MHTS Features: - 5 category triage scale specific to mental health concerns that can be integrated with	ATS Features: - 5 category triage scale used by the Australasian College for	Confidence level*: Not: 0% vs. 13.0% Mildly: 3.7% vs. 60.8% Moderately: 77.7% vs. 26.0% Very: 18.5% vs. 0% Perception of timeframe*: Appropriate: 88.8% vs. 26.0%	The MHTS improved nurses' confidence in mental health triage, triage distribution of clinical acuity, and perceived appropriateness of time to care by mental health staff.

First Author	Primary Objective	Outcomes (primary/secondary)	Intervention (I) and Key Features	Comparison (C) and Key Features	Results (I vs. C)	Conclusion
Smart	To develop a triage scale (MHTS) consistent with the National scale (NTS) for patients with mental health problems attending the ED.	Primary: ED wait time, transit time	the Australasian Triage Scale (ATS)	Emergency Medicine	Not suitable: 11.1% vs. 8.6% Triage categorization: 1: 5.2% vs. 1.3% 2: 11.6% vs. 7.5% 3: 52.3% vs. 41.7% 4: 26.9% vs. 48.4% 5: 3.7% vs. 0.8% Change in triage distribution: $p < 0.001$	The MHTS reduced wait and transit times.

NTS: National Triage Scale; MHTS: Mental Health Triage Scale; ATS: Australasian Triage Scale; CTAS: Canadian Triage & Acuity Scale; * Statistical comparison of differences not reported

Table 4

Effects of Other ED Mental Health Care (Adult or Unknown Population)

First Author	Primary Objective	Outcomes (primary/secondary)	Intervention (I) and Key Features	Comparison (C) and Key Features	Results (I vs. C)	Conclusion
Griffey	To evaluate the effect of a computerized order entry system forcing function on improving timely renewal of restraint orders.	Primary: time to renewal of restraint orders Secondary: time spent in restraint	Computerized Reminders of Restraint Orders Features: - 'Soft stop': passive prompts for physician to renew restraint orders with warning, but not execution of computer lockout for failure to take action - 'Hard stop': forced renewal or discontinuation of restraint orders before expiration, with failure to act resulting in computer lockout until addressed	Standard Care Features: - No computerized reminder system	Time to Renewal (median, IQR): B: Soft stop: 125 min (114–149) vs. C: Hard stop: 133 min (120–148) vs. A: Control: 189 min (182–196) A vs. B: $p < 0.001$ A vs. C: $p < 0.001$ B vs. C: $p = 0.3$ Time spent in restraint (median, IQR): B: 190 min (115–300) vs. C: 130 min (85–265) vs. A: 235 min (107–403) A vs. B: $p = 0.96$ A vs. C: $p = 0.06$ B vs. C: $p = 0.33$	The forcing order function improved physician practice around order renewal and reduced time spent in restraint.
Damsa	To investigate the clinical and economic impact of crisis intervention on psychiatric emergency admissions.	Primary: hospitalization rate	Crisis Intervention Features: - Medical team (two residents under supervision of a psychiatrist) discusses issues surrounding crisis - Exploration of the subjective experience	Standard Care Features: - Assessment by the same medical team, but without the Crisis Intervention model	Hospitalization rate: OR= 0.59 (95%CI:0.43,0.82)	Crisis intervention led to a shift from hospitalization to discharge for outpatient management in emergency psychiatric services.
Spooren	To evaluate the short-term outcome of a multi-disciplinary crisis intervention for psychiatric patients referred to the ED.	Primary: state of distress (measured by GHQ)	Multidisciplinary Crisis Intervention Team Features: - Possibility for inpatient stay, crisis management, consultations with partners and families, social interventions, problem-focused therapy, and motivational counseling towards further treatment	Standard Care Features: - Public health care: general ED, large psychiatric facilities available	Distress: MD= -0.52 (95%CI: NR) $p = NS$	A short hospital-based crisis intervention approach is comparable with more traditional acute inpatient treatment in reducing distress.
Wood	To evaluate the ED psychiatric consultations by psychologists and psychiatrists following legislative changes.	Primary: disposition	Evaluation by a psychologist in the ED	Evaluation by a psychiatrist in the ED	Involuntary admission: OR= 1.10 (95%CI:0.97, 1.25)	There were no differences in disposition decisions between psychologists and psychiatrists following legislative changes. Both groups of clinicians increased recommendations for involuntary admission.

GHQ: General Health Questionnaire; NA: not available; NS: not statistically significant