Protocol for an Evidence-based Practice Center Rapid Review

Project Title: *Making Healthcare Safer IV: Failure to Rescue - Rapid Response Systems*

Publication Date: September 7, 2023
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Review Questions

1. What is the frequency and severity of harms associated with the failure to rescue that is targeted by rapid response system patient safety practices (PSPs)?

2. What patient safety measures or indicators have been used to examine the harms associated with this failure to rescue target?

3. What rapid response system PSPs have been used to prevent or mitigate the harms and in what settings have they been used?

4. What is the rationale for the PSPs that have been used to prevent or mitigate the harms associated with failure to rescue?

5. What are the effectiveness and unintended effects of rapid response system PSPs and what new evidence has been published since the search was done for the Making Healthcare Safer (MHS) III report in 2019?

6. What are common barriers, limitations and facilitators to successfully implementing rapid response system PSPs?

7. What resources (e.g., cost, staff, time) are required for implementation of rapid response systems?

8. What toolkits are available to support implementation of rapid response system PSPs?

Context and Domain Being Studied

The Agency for Healthcare Research and Quality (AHRQ) Making Healthcare Safer (MHS) reports consolidate information for healthcare providers, health system administrators, researchers, and government agencies about practices that can improve patient safety across the healthcare system—from hospitals to primary care practices, long-term care facilities, and other healthcare settings. In Spring of 2023, AHRQ launched its fourth iteration of the MHS Report (MHS IV). Rapid response systems as a PSP was identified as high priority for inclusion in the MHS IV reports using a modified Delphi technique by a Technical Expert Panel (TEP) that met in December 2022. The TEP included 15 experts in patient safety with representatives of governmental agencies, healthcare stakeholders, clinical specialists, experts in patient safety issues, and a patient/consumer perspective. See the MHS IV Prioritization Report for additional details.[1]

Unexpected deterioration in hospitalized patients on general hospital wards may result in cardiorespiratory arrest, which can cause additional morbidity and mortality. These events may be heralded by clear premonitory signs and symptoms that create opportunities to recognize the deterioration in a timely manner, intervene to stabilize the patient, and halt the progression of clinical deterioration.[2-11] Rapid response systems were developed to respond to early warnings of this patient safety and quality hazard,[12-18] but their effectiveness may be limited by a variety of factors impacting rapid response system activation (i.e., afferent limb failure) or response (i.e., efferent limb failure).[15, 19-21]

Overview of the PSP

Rapid response systems were implemented in the mid-1990's to address the problem of unrecognized clinical deterioration on general hospital wards with the goal of preventing cardiorespiratory arrests. Activation criteria were generated using data gathered from studies that defined the premonitory signs and symptoms of cardiorespiratory arrest.[2-11] General ward staff were educated on the importance of early recognition of the signs and symptoms of clinical deterioration, and how to activate the response team if and when patients met activation criteria (i.e., the afferent limb of rapid response). This response team (i.e., the efferent limb) would then rapidly come to the patient's bedside to assess, intervene if necessary, and potentially triage patients to a higher level of care. In 2009, The Joint Commission made response to general ward clinical deterioration a patient safety goal leading to widespread implementation of rapid response

systems in the U.S.[22] However, despite decades of dissemination and implementation of rapid response processes, patients still experience unrecognized deterioration on general hospital wards and activation of the rapid response system is often delayed or does not occur due to failure of monitoring and recognition of clinical deterioration. The previous MHS report (MHS III)[23] found moderate evidence that rapid response systems are effective in reducing cardiorespiratory arrest but the evidence was inconclusive as to how they reduce hospital mortality and intensive care unit (ICU) transfers. Any benefit from rapid response systems may take time to be realized. Other reports have shown that rapid response systems need to reach a threshold of utilization (i.e., a 'dose' defined as the number of activations per 1000 admissions) to have measurable impact.[24] The MHS III report also found that afferent and efferent limb failures impact the effectiveness of rapid response systems.

In the prioritization process, the MHS IV TEP advised that rapid response systems be defined more broadly as 'systems' to allow for focus on newer work on identification of at-risk individuals and implementation through 'systems' such as automated alerts for vital signs or daily huddles. In this review, we adopt this broader view and focus on both afferent and efferent limbs of a rapid response system. While patient monitoring as a PSP has become a focus of rapid response system afferent limb improvement efforts, we will not include patient monitoring as a component of this Rapid Review. Patient monitoring merits a separate PSP review since patient monitoring is a relevant topic to areas of care not commonly serviced by rapid response systems such as emergency departments and patient monitoring has intersections with other patient safety concerns such as alarm and alert fatigue. Studies to be included here will need to include efferent limb information and not focus solely on patient monitoring and the afferent limb. We expect that a separate review of patient monitoring PSPs will capture broad aspects of patient monitoring including its role and impacts in all areas including the afferent limb, alarm and alert fatigue, predictive analytics for deterioration, etc.

Purpose of the Rapid Review

The overall purpose of this review is to describe the current literature on the effectiveness of efforts to optimize the afferent and efferent limbs of rapid response systems aimed to mitigate failure to rescue and decrease the incidence of in-hospital cardiorespiratory arrest, hospital mortality and avoidable ICU transfer.

Methodologic Approach

For this rapid review, strategic adjustments will be made to streamline traditional systematic review processes and deliver an evidence product in the time allotted by the AHRQ Evidence-based Practice Center Program. Adjustments include being as specific as possible about the questions, limiting the number of databases searched, modifying search strategies to focus on finding the most relevant studies (i.e., being flexible on sensitivity to increase the specificity of the search), and restricting the search to studies published recently (e.g., since the year when the search was done for the MHS III report) in English, and having each study assessed by a single reviewer. Depending on the expected volume of literature, the EPC team may opt to have a randomly selected 10% sample of articles checked by a second reviewer or use the artificial intelligence (AI) feature of DistillerSR (AI Classifier Manager) as a second reviewer at the title and abstract screening stage, as described below in the section on Data Extraction.

We will ask our content experts to answer Review Questions 1 and 2 by citing selected references that best answer the questions without conducting a systematic search for all evidence on the targeted harms and related patient safety measures or indicators as these harms are well documented in this body of literature. For Review Question 2, we will focus on identifying relevant measures that are included in the Centers for Medicare & Medicaid Services (CMS) patient safety measures, AHRQ's Patient Safety Indicators (PSIs), or the National Committee for Quality Assurance (NCQA) patient safety related measures.

We will ask our content experts to answer Review Questions 3 and 4 by citing selected references, including PSPs used and explanations of the rationale presented in the studies we find for Review Question 5. For Review Questions 6 and 7, we will focus on the barriers, facilitators, and required resources reported in the studies we find for Review Question 5. For Review Question 8, we will identify publicly available patient safety toolkits developed by AHRQ or other organizations that could help to support implementation of the PSPs for failure to rescue. To accomplish that task, we will review AHRQ's Patient Safety Network (PSNet) (https:/psnet.ahrq.gov) and AHRQ's listing of patient safety related toolkits (see https://www.ahrq.gov/tools/index.html?search_api_views_fulltext=&field_toolkit_topics=14170&sort_by=title&sort_order=ASC) and we will include any toolkits mentioned in the studies we find for Review Question 5. We will identify toolkits without assessing or endorsing them.

Eligibility Criteria for Studies of Effectiveness

We will search for original studies and systematic reviews on review question 5 according to the inclusion and exclusion criteria presented in Table 1.

Table 1. Inclusion and Exclusion Criteria

Study Parameter	Inclusion criteria	Exclusion criteria
Population	Hospitalized patients on general hospital wards (non-ICU patients)	• ICU patients who are not the target population for rapid response systems • ED patients who are not eligible for rapid response system activation. • Non-patients (staff, visitors) who are not covered by rapid response teams
Intervention*	Implementation or maintenance of a rapid response system regardless of afferent or efferent limb structure. .	• Intervention does not include an in-hospital team of responders. • Disease-specific rapid response systems such as brain attack teams
Comparator	Defined time periods (such as historically controlled "before-after" trials) or cohort group(s) of patients without a rapid response system implemented.	No defined historical or contemporaneous cohort comparison group
Outcome	• Incidence of cardiorespiratory arrest • Hospital mortality • Transition to higher level of care (ICU, procedural area [e.g., operating room, interventional radiology] • Serious adverse events related to clinical deterioration such as unanticipated ICU admission • Unintended consequences of the efferent limb team members leaving their primary responsibilities to respond to an activation	No outcome of interest.
Timing	Original studies and systematic reviews published since 2018	Published before 2018
Study Time Period	Defined study periods with and without an rapid response system for trials with historical or other comparison groups. For cohort studies and trials, the study time frame also needs to be specified	Study time periods are not defined.
Setting	Any in-hospital general ward that is not an ICU.	Inclusion of non-general ward patients such as ED or ICU patients
Type of studies	RCTs, non-randomized trials, and observational studies with a comparison group.	• Study design not specified or no control described • Comparator group is not appropriate (would not have equivalent exposure to the intervention)

ED = emergency department; MHS =Making Healthcare Safer; ICU =intensive care unit;
RCT =randomized controlled trial
*Automated alerts for vital signs or daily huddles will be covered under "Patient Monitoring Systems" topic.

Literature Searches for Studies of Effectiveness

Our search strategy will focus on databases expected to have the highest yield of relevant

studies, including PubMed and the Cochrane Library, supplemented by a narrowly focused search for unpublished reports that are publicly available from governmental agencies or professional societies having a strong interest in the topic.

Data Extraction

To efficiently identify studies that meet the eligibility criteria, we will distribute citations from the literature search to team members, with plans to have the title and abstract of each citation reviewed by a single team member. We will use the artificial intelligence (AI) feature of DistillerSR (AI Classifier Manager) as a semi-automated screening tool to conduct this review efficiently at the title and abstract screening stage. The title and abstract of each citation will be reviewed by a team member, and then the AI Classifier Manager will serve as a second reviewer of each citation. The full text of each remaining potentially eligible article will be reviewed by a single team member to confirm eligibility and extract data. Depending on the results of the literature search, the team will decide whether it has enough time and resources to ask a second team member to check a randomly selected 10% sample of the articles to verify that relevant studies were not excluded and confirm the accuracy of extracted data.

Information will be organized according to the review questions, and will include author, year, study design, frequency and severity of the harms, measures of harm, characteristics of the PSP, rationale for the PSP, outcomes, unintended consequences implementation barriers and facilitators, required resources, and description of toolkits. To streamline data extraction, we will sort eligible studies by specific PSP (if the report covers more than one specific practice), and focus on extracting information about characteristics, outcomes, and barriers/facilitators most pertinent to a specific PSP.

Risk of Bias (Quality) Assessment

For studies that address Question 5 about the effectiveness of PSPs, the primary reviewer will use the Cochrane Collaboration's tool for assessing the risk of bias of randomized controlled trials (RCTs) or the ROBINS-I tool for assessing the Risk Of Bias In Non-randomized Studies – of Interventions.[25, 26] When assessing RCTs, we will use the 7 items in the Cochrane Collaboration's tool that cover the domains of selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias.[25] When assessing non-randomized studies, we will use specific items in the ROBINS-I tool that assess bias due to confounding, bias in selection of

participants into the study, bias in classification of interventions, bias due to deviations from intended interventions, bias due to missing data, bias in measurement of outcomes, and bias in selection of the reported results.[26] The risk of bias assessments will focus on the stated primary outcome of interest in each study.

If we identify an eligible systematic review published since the last MHS report, the primary reviewer will use the criteria developed by the United States Preventive Services Task Force Methods Workgroup for assessing the quality of systematic reviews.[27]

- **Good** - Recent relevant review with comprehensive sources and search strategies; explicit and relevant selection criteria; standard appraisal of included studies; and valid conclusions.
- **Fair** - Recent relevant review that is not clearly biased but lacks comprehensive sources and search strategies.
- **Poor** - Outdated, irrelevant, or biased review without systematic search for studies, explicit selection criteria, or standard appraisal of studies.

The Task Leader will review the risk of bias assessments and any disagreements will be resolved through discussion with the team.

Strategy for Data Synthesis

Selected data will be compiled into evidence tables and synthesized narratively. We will group the different types of study design according to their strength. We will not conduct a meta-analysis. For Question 5 about the effectiveness of PSPs, we will record information about the context of each study and whether the effectiveness of the PSP differs across patient subgroups. If any of the PSPs have more than one study of effectiveness, we will grade the strength of evidence for those PSPs using the methods outlined in the AHRQ Effective Health Care Program (EHC) Methods Guide for Effectiveness and Comparative Effectiveness Reviews.[28] Evidence grading would not add value for PSPs that do not have more than one available study.

Analysis of Subgroups or Subsets

We will perform a sub-group analysis for pediatric patients and adults for Question 5 only.

Summary of Protocol Amendments

Table 2. Summary of Protocol Amendments

Date	Section	Original Protocol	Revised Protocol	Rationale
September 19th, 2023	Methodologic Approach- Table 1. Inclusion and Exclusion Criteria		We will exclude primary studies that do not include hospital settings in the United States.	Due to time constraints and the desire to focus on studies most relevant to hospital systems in the United States, we want to clarify that we are focusing on studies performed in the United States. The literature has a sufficient number of studies performed in the United States to be able to answer the review question.

Registration

We will submit the protocol to AHRQ and to the PROSPERO international prospective register of systematic reviews.

EPC Team Disclosures

EPC core team members must disclose any financial conflicts of interest greater than $1,000 and any other relevant business or professional conflicts of interest. Related financial conflicts of interest that cumulatively total greater than $1,000 will usually disqualify EPC core team investigators.

External Peer Review

Peer reviewers are invited to provide written comments on the draft report based on their clinical, content, or methodological expertise. The EPC considers all peer review comments on the draft report in preparation of the final report. Peer reviewers do not participate in writing or editing of the final report or other products. The final report does not necessarily represent the views of individual reviewers. The EPC will complete a disposition of comments document that will provide a high-level summary of the response to peer review comments.

We will ask at least one clinical content expert and one methodological expert to review the draft

report. Potential peer reviewers must disclose any financial conflicts of interest greater than $5,000 and any other relevant business or professional conflicts of interest. Invited peer reviewers may not have any financial conflict of interest greater than $5,000.

Role of the Funder

This project is funded under Contract No. 75Q80120D00003/75Q80123F32011 from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. The AHRQ Task Order Officer will review contract deliverables for adherence to contract requirements and quality. The authors of this report are responsible for its content. Statements in the report should not be construed as endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

Format and Content of Report

The report will follow the most recent template approved by AHRQ at the time of approval of the protocol.

References

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