**SUPPLEMENTAL DIGITAL CONTENTS**

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**Supplemental Digital Content 1. Panel Membership and Communications**

***Selection of guideline leadership***

Guideline leadership consisted of co-chairs (FS, RW) and co-vice-chairs (DP, GL), supported by two clinician-methodologists from the GUIDE group at McMaster University (KH, BR). Selection of the leadership for this guideline and all others is the responsibility of the Society of Critical Care Medicine (SCCM) Board of Regents (BOR). The BOR follows the rules provided in the SCCM guidelines Standard Operating Procedures Manual (SOP) which is that the BOR identifies two chairs and two co-vice chair subject matter experts for each SCCM-approved guideline. There was a due consideration for diversity, equity and inclusion in the process and particular attention is paid to assuring that expertise is evaluated via submission of the Curriculum Vitae of each candidate. The BOR reviewed declared conflicts of interest (COI) for adjudication prior to appointment using the SCCM COI system.

***Selection of panelists***

An interdisciplinary panel of 23 members was then identified by the appointed guidelines leadership, again following the SOP requirements followed by BOR review. The choice of panel members was based on clinical expertise in early recognition and response to critical illness outside the ICU and Rapid Response Systems (RRS) with attention to diversity, equity, and inclusion in the process of panel selection. Patient representatives were selected similarly to serve as advisors regarding the patient experience and participated as full panel members throughout the process. Each member of the panel completed the required COI forms before they were officially appointed to the panel. Panelists served at the discretion of the BOR with ongoing monitoring of COI and performance.

***Panel communications***

The full panel held regular meetings to establish the scope of the guidelines, generate a series of clinical questions of interest (PICO questions), and generate recommendations using the GRADE Methodology. Meetings were facilitated by Zoom video-conferencing hosted by SCCM with one in-person meeting held at the annual SCCM Congress in Orlando, Florida (February 2020). Guidelines leadership (co-chairs, co-vice-chairs, and clinician-methodologists) held regular video conference calls via Zoom to refine processes and address barriers. Voting activities (i.e., outcome prioritization ratings and voting on recommendations) were facilitated by Survey Monkey.

**Supplemental Digital Content 2. Conflict of Interest Management**

SCCM maintains a commitment to trustworthy guidelines through a strict [conflict of interest disclosure and management process](https://www.sccm.org/getattachment/Clinical-Resources/Guidelines/Guideline-Development-Resources/ACCM-Guidelines-Conflict-of-Interest-COI.pdf?lang=en-US). There were no disclosures directly related to the PICO questions within this guideline that required individual authors to abstain from voting on any recommendations. Disclosures are collected prior to voting by SCCM through a conflict of interest platform and voting is accomplished using Survey Monkey ([http://www.surveymonkey.com](http://www.surveymonkey.com/)).

**Supplemental Digital Content 3. Scope and PICO Questions**

**Scope of the guideline**

The scope of the guideline was determined by the co-chairs and co-vice-chairs in consultation with the full panel. The full panel generated a list of topics pertinent to the recognition of clinical deterioration among patients hospitalized outside the intensive care unit (ICU). These included monitoring practices and trigger systems that may aid in the recognition of clinical deterioration and the response to these triggers, with a focus on Rapid Response Systems (RRS) components that may be employed in response to clinical deterioration.

**Question Development**

Subsequently, the panel formulated a series of actionable questions relevant to the scope of the guideline, following the PICO (Population, Intervention, Comparison, Outcomes) format that could potentially lead to an actionable recommendation statement. For each PICO, the panel identified potential subgroup analyses of interest to be considered, subject to the availability of data during the literature review process. All PICO questions are listed in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Population** | **Intervention** | **Comparison** | **Outcomes** |
| **Recognizing clinical deterioration outside the ICU** | | | |
| **Should continuous vital sign monitoring compared to no continuous vital sign monitoring be used in all (unselected) patients hospitalized outside the ICU?** | | | |
| All adult general non-ICU patients [including those in the ED] excluding patients on a palliative or non-escalation pathway | Implementation of automated continuous or high frequency (i.e., < 1-hour intervals) physiologic monitoring *(broadly defined pending literature search)*  **Subgroups to consider (depending on data availability):** Possible automated EMR driven continuous monitoring (with automatic flags), certain patient subgroups, look at subgroups related to how the data is monitored & handled | Usual care (i.e. intermittent vital sign checks) | SDC 4 |
| **Should hospitals provide focused education for non-ICU staff on early recognition of clinical deterioration compared with no focused education?** | | | |
| Staff in non-ICU inpatient hospital settings [including the ED] | Focused education on early clinical deterioration  **Subgroups to consider (depending on data availability):** EWS-focused education vs. RRT/MET-focused education | Usual care [no focused education] | SDC 4 |
| **Should patient/ family member/ care partner activation of RRT/MET be included as a formal part of an early warning system as compared to no formal inclusion?** | | | |
| All adult general non-ICU patients [including those in the ED] excluding patients on a palliative or non-escalation pathway | Incorporating patient/family reports of illness/wellness into EWS (e.g., on Likert scale) **Subgroups to consider (depending on data availability):** family activation of rapid response system | No formal incorporation of patient/family report systems | SDC 4 |
| **Responding to clinical deterioration outside the ICU** | | | |
| **A. Should hospitals implement hospital-wide explicit activation criteria to help recognize deteriorating non-ICU patients as compared with no such criteria?**  **B. Should hospitals deploy a designated RRT/MET as compared to the absence of an RRT/MET?** | | | |
| All adult general non-ICU patients [including those in the ED] excluding patients on a palliative or non-escalation pathway | Hospital-wide deployment of explicit criteria  **Subgroups to consider (if possible):** Use of various triggers, i.e., vital signs alone vs. composite scores such as early warning scores, single vs. multiple components, subjective vs. objective | No explicit criteria | SDC 4 |
| Hospitals  Potential subgroups of interest: academic vs community, tertiary, geographical, by type of unit (surgical vs medical) | Presence of rapid response team  **Subgroups to consider (depending on data availability):** compare RRS with and without significant afferent arm education on earlier recognition (i.e., EWS vs no EWS, 24-hour vs daytime hours only), proactive vs. reactive | Lack of a designated rapid response team | SDC 4 |
| **A. Should an RRT/MET be led by a ‘prescribing’ as compared to a ‘non-prescribing’ clinician?**  **B. Should an RRT/MET be led by a physician as compared to a non-physician?** | | | |
| Hospitals  Potential subgroups of interest: academic vs community, geographical, by type of unit (surgical vs medical) | RRT/MET led by a ‘ordering/ prescribing’ clinician  **Subgroups to consider (depending on data availability):** MD-led versus non-physician-led, advanced practice clinician led vs. not, critical care trained clinician vs. not | RRT/MET not led by ordering clinician | SDC 4 |
| **Should an RRT/MET include palliative care trained personnel and/or focused education/guidance regarding goals of care discussions for clinicians?** | | | |
| All adult general non-ICU patients [including those in the ED] excluding patients on a palliative or non-escalation pathway | Deployment of RRS incorporating palliative care education or personnel  **Subgroups to consider (depending on data availability):** Elderly patients, patients with multiple comorbidities | RRS not incorporating formal palliative care education or personnel | SDC 4 |
| **Should there be a quality improvement (QI) component such as debriefing and recording/ reporting of metrics as part of a RRS?** | | | |
| Hospitals  Potential subgroups of interest: academic vs community, geographical, by type of unit (surgical vs medical) | RRS with a quality improvement component such as debriefing and recording/ reporting of metrics  **Subgroups to consider (depending on data availability):** Family inclusion in debriefing | RRS without a quality improvement component | SDC 4 |

**Supplemental Digital Content 4. Outcome Prioritization**

The panel identified a list of outcomes they deemed to be pertinent of the actionable PICO statements. Using the GRADE approach to outcome prioritization, each panel member independently rated each outcome on a scale of 1 to 9 (1= least important; 9 = critical to decision making). Panel members were asked to rate the importance of each of the listed outcomes **from the perspectives of patients.**Mean scores were then calculated for each outcome and categorized them based on the below ‘Scoring Guide’. The final outcome ratings are displayed in the table below.

**Scoring Guide**

|  |  |
| --- | --- |
| **SCORES** | **IMPORTANCE** |
| **1-3** | **Limited Importance** |
| **4-6** | **Important** |
| **7-9** | **Critically important** |

**Outcome Prioritization**

**A picture containing table

Description automatically generated**

*n = 22 panelists*

**Supplemental Digital Content 5. Literature search strategy**

Working with a GUIDE group medical librarian at St. Joseph’s Healthcare Hamilton, the two clinician-methodologists performed a literature search to identify potentially relevant English language articles. The following electronic databases were searched: MEDLINE (1946 to, January 22, 2020), EMBASE (1974 to January 22, 2020), CENTRAL (*The Cochrane Library* Issue 12, 2019), ClinicalTrials.gov (January 23, 2020), WHO International Clinical Trials Registry Platform (ICTRP) (January 24, 2020).

**Search Strategy**

Embase <1974 to 2020 January 22>, and OVID Medline Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present

1. exp animals/

2. exp animal experimentation/ or exp animal experiment/

3. exp models animal/

4. nonhuman/

5. exp vertebrate/ or exp vertebrates/

6. 1 or 2 or 3 or 4 or 5

7. exp humans/

8. exp human experimentation/ or exp human experiment/

9. 7 or 8

10. 6 not 9

11. (Randomized Controlled Trial or Controlled Clinical Trial or Pragmatic Clinical Trial or Equivalence Trial or Clinical Trial, Phase III).pt.

12. Randomized Controlled Trial/

13. exp Randomized Controlled Trials as Topic/

14. "Randomized Controlled Trial (topic)"/

15. Controlled Clinical Trial/

16. exp Controlled Clinical Trials as Topic/

17. "Controlled Clinical Trial (topic)"/

18. Randomization/

19. Random Allocation/

20. Double-Blind Method/

21. Double Blind Procedure/

22. Double-Blind Studies/

23. Single-Blind Method/

24. Single Blind Procedure/

25. Single-Blind Studies/

26. Placebos/

27. Placebo/

28. Control Groups/

29. Control Group/

30. (random\* or sham or placebo\*).ti,ab,hw,kf,kw.

31. ((singl\* or doubl\*) adj (blind\* or dumm\* or mask\*)).ti,ab,hw,kf,kw.

32. ((tripl\* or trebl\*) adj (blind\* or dumm\* or mask\*)).ti,ab,hw,kf,kw.

33. (control\* adj3 (study or studies or trial\* or group\*)).ti,ab,kf,kw.

34. (Nonrandom\* or non random\* or non-random\* or quasi-random\* or quasirandom\*).ti,ab,hw,kf,kw.

35. allocated.ti,ab,hw.

36. ((open label or open-label) adj5 (study or studies or trial\*)).ti,ab,hw,kf,kw.

37. ((equivalence or superiority or non-inferiority or noninferiority) adj3 (study or studies or trial\*)).ti,ab,hw,kf,kw.

38. (pragmatic study or pragmatic studies).ti,ab,hw,kf,kw.

39. ((pragmatic or practical) adj3 trial\*).ti,ab,hw,kf,kw.

40. ((quasiexperimental or quasi-experimental) adj3 (study or studies or trial\*)).ti,ab,hw,kf,kw.

41. (phase adj3 (III or "3") adj3 (study or studies or trial\*)).ti,hw,kf,kw.

42. or/11-41

43. epidemiologic methods/

44. epidemiologic studies/

45. observational study/

46. observational studies as topic/

47. clinical studies as topic/

48. controlled before-after studies/

49. cross-sectional studies/

50. historically controlled study/

51. interrupted time series analysis/

52. exp seroepidemiologic studies/

53. national longitudinal study of adolescent health/

54. cohort studies/

55. cohort analysis/

56. longitudinal studies/

57. longitudinal study/

58. prospective studies/

59. prospective study/

60. follow-up studies/

61. follow up/

62. followup studies/

63. retrospective studies/

64. retrospective study/

65. case-control studies/

66. exp case control study/

67. cross-sectional study/

68. observational study/

69. quasi experimental methods/

70. quasi experimental study/

71. (observational study or validation studies or clinical study).pt.

72. (observational adj3 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

73. cohort\*.ti,ab,kf,kw.

74. (prospective adj7 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

75. ((follow up or followup) adj7 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

76. ((longitudinal or longterm or (long adj term)) adj7 (study or studies or design or analysis or analyses or data)).ti,ab,kf,kw.

77. (retrospective adj7 (study or studies or design or analysis or analyses or data or review)).ti,ab,kf,kw.

78. ((case adj control) or (case adj comparison) or (case adj controlled)).ti,ab,kf,kw.

79. (case-referent adj3 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

80. (population adj3 (study or studies or analysis or analyses)).ti,ab,kf,kw.

81. (descriptive adj3 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

82. ((multidimensional or (multi adj dimensional)) adj3 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

83. (cross adj sectional adj7 (study or studies or design or research or analysis or analyses or survey or findings)).ti,ab,kf,kw.

84. ((natural adj experiment) or (natural adj experiments)).ti,ab,kf,kw.

85. (quasi adj (experiment or experiments or experimental)).ti,ab,kf,kw.

86. ((non experiment or nonexperiment or non experimental or nonexperimental) adj3 (study or studies or design or analysis or analyses)).ti,ab,kf,kw.

87. (prevalence adj3 (study or studies or analysis or analyses)).ti,ab,kf,kw.

88. or/43-87

89. meta-analysis.pt.

90. meta-analysis/ or systematic review/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/

91. ((systematic\* adj3 (review\* or overview\*)) or (methodologic\* adj3 (review\* or overview\*))).ti,ab,kf,kw.

92. ((quantitative adj3 (review\* or overview\* or synthes\*)) or (research adj3 (integrati\* or overview\*))).ti,ab,kf,kw.

93. ((integrative adj3 (review\* or overview\*)) or (collaborative adj3 (review\* or overview\*)) or (pool\* adj3 analy\*)).ti,ab,kf,kw.

94. (data synthes\* or data extraction\* or data abstraction\*).ti,ab,kf,kw.

95. (handsearch\* or hand search\*).ti,ab,kf,kw.

96. (mantel haenszel or peto or der simonian or dersimonian or fixed effect\* or latin square\*).ti,ab,kf,kw.

97. (met analy\* or metanaly\* or technology assessment\* or HTA or HTAs or technology overview\* or technology appraisal\*).ti,ab,kf,kw.

98. (meta regression\* or metaregression\*).ti,ab,kf,kw.

99. (meta-analy\* or metaanaly\* or systematic review\* or biomedical technology assessment\* or bio-medical technology assessment\*).mp,hw.

100. (medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.

101. (cochrane or (health adj2 technology assessment) or evidence report).jw.

102. (meta-analysis or systematic review).mp.

103. (comparative adj3 (efficacy or effectiveness)).ti,ab,kf,kw.

104. (outcomes research or relative effectiveness).ti,ab,kf,kw.

105. ((indirect or indirect treatment or mixed-treatment) adj comparison\*).ti,ab,kf,kw.

106. or/89-105

107. (42 or 88 or 106) not 10

108. exp Hospitals/ or exp Hospital Units/ or exp Hospital/

109. (hospital$ or WARD or WARDS).ti.

110. Hospitalization/

111. hospital$.ab.

112. "length of stay"/ or Patient admission/ or Patient discharge/ or Patient readmission/ or Patient transfer/ or hospital admission/ or hospital discharge/ or hosptial readmission/ or patient transport/

113. ((patient? or hospital$).ti,hw. and (discharg$ or admission? or admit\* or re-admit\* or readmission? or readmit$ or transfer?).ti.) or "length of stay".ti.

114. (((patient? or hospital?) adj2 (discharg$ or admission? or admitting or readmission? or transfer?)) or "length of stay").ab.

115. Inpatients/ or hospital patient/

116. (inpatient? or in-patient?).ti.

117. exp Hospital departments/ or Hospital shared services/ or hospital department/ or exp hospital service/

118. medical staff, hospital/ or hospitalists/ or medical staff/

119. 108 or 109 or 110 or 111 or 112 or 113 or 114 or 115 or 116 or 117 or 118

120. clinical deterioration/ or deterioration/

121. (deteriorat\* adj (patient or sign\* or clinic\*)).ti,ab.

122. (exp \*disease progression/ or disease exacerbation/) and (sign\* or signal\* or alert\*).ti,ab.

123. 120 or 121 or 122

124. guidelines as topic/ or practice guidelines as topic/ or exp practice guideline/

125. guideline adherence/ or protocol compliance/

126. exp critical pathways/ or clinical pathway/

127. (guideline? not (guideline? adj2 author?)).ti,ab.

128. ((pathway? or protocol? or algorithm?) adj2 (clinical or treatment? or diagnos$ or management or infection? or infectious? or antibiotic?)).ti,ab.

129. critical pathway?.ti,ab.

130. guidance.ti,ab.

131. (quality adj2 (impact or effect$)).ti,ab.

132. (quality adj2 (improv$ or manage$ or care or healthcare)).ti,ab.

133. 124 or 125 or 126 or 127 or 128 or 129 or 130 or 131 or 132

134. 119 and 123 and 133

135. 107 and 134

136. early warning scoring system.ti,ab,kw.

137. (warn\* or score or scoring).ti,ab,kw.

138. exp severity of illness index/ or "severity of illness index"/

139. rescue strategies.ti,ab.

140. \*health status indicators/ or exp health status indicator/

141. ((rapid response? or medical emergenc\*) adj (team? or system?)).ti,ab.

142. 136 or 137 or 138 or 139 or 140 or 141

143. 123 or 142

144. 119 and 143

145. exp Personnel, Hospital/ed [Education]

146. (educat\* or teach\* or train\* or instruct\*).ti.

147. exp Personnel, Hospital/ or exp hospital personnel/

148. staff.ti,ab.

149. 147 or 148

150. 146 and 149

151. 144 and (145 or 150)

152. 107 and 151

153. early warning scoring system.ti,ab,kw.

154. (NEWS or HEWS or EWS).ti,ab,kw.

155. (warn\* or score or scoring).ti,ab,kw.

156. 154 and 155

157. ((warn\* or score or scoring) adj system).ti,ab,kw.

158. 153 or 156 or 157

159. 123 and 158

160. exp \*machine learning/

161. (119 or 123) and 155 and 160

162. 159 or 161

163. 107 and 162

164. hospital rapid response team/ or exp rapid response team/

165. rapid response system?.ti,ab.

166. (rapid response adj system?).ti,ab.

167. medical emergency team?.ti,ab.

168. ((rapid response or cardiac crash or code) adj team\*).ti,ab.

169. hospital medical emergency team?.ti,ab.

170. or/164-169

171. 119 and 170

172. 107 and 171

173. vital signs/ or vital sign/

174. vital sign\*.ti,ab,kw.

175. (frequent\* or continuous or real-time or real time or infrequent\* or intermittent\*).ti,ab,kw.

176. monitor\*.ti,ab,kw.

177. exp monitoring, physiologic/ or exp physiologic monitoring/

178. (173 or 174) and 175 and (176 or 177)

179. 107 and 178

180. Palliative Care/ or exp palliative therapy/

181. palliative\*.ti,ab,kw.

182. 180 or 181

183. (156 or 170) and 182

184. 107 and 183

185. exp Family/

186. diagnostic self evaluation/ or self evaluation/

187. ((family or self\*) adj (assess\* or evaluat\*)).ti,ab.

188. 185 or 186 or 187

189. 158 and 188

190. 107 and 189

191. 134 or 151 or 162 or 171 or 178 or 183 or 189

192. 107 and 191

193. 135 or 152 or 163 or 172 or 179 or 184 or 190

194. 193 use ppez

195. 193 use oemezd

**COCHRANE Controlled Clinical Trials Registry (*The Cochrane Library* Issue 12, 2020)**

#1 MeSH descriptor: [Clinical Deterioration] explode all trees

#2 (deteriorat\* adj (patient or sign\* or clinic\*)).ti,ab.

#3 MeSH descriptor: [Disease Progression] explode all trees

#4 (sign\* or signal\* or alert\*).ti,ab.

#5 #3 and #4

#6 #1 or #2 or #5

7 clinical trials

**Clinical Trials.gov**

Advanced search, no date limit applied

Other terms: ( "Clinical Deterioration" OR "early warning score" OR "rescue strategies" OR "rapid response" OR NEWS OR HEWS OR EWS OR "medical emergency team" OR "continuous monitoring" or "frequent monitoring" )

87 studies

**WHO International Clinical Trials Registry Platform (ICTRP)**

Advanced search

Condition: “deterioration” (without synonyms box unchecked)

OR

Intervention: "early warning score" OR "rapid response" OR "medical emergency team"

Recruitment status: “all”  
Phases: “all”

63 studies

**Supplemental Digital Content 6. Systematic Review and Data Synthesis**

**1. Article Selection**

The results of the literature search were imported into Covidence.org, a web-based systematic review software, which we used to perform article selection. A team of reviewers (KH, BR, VCD, PK, SW, JDH) screened all titles and abstracts, independently and in duplicate, to select articles that were potentially relevant to any of the guideline PICOs. The same team then performed text screening, independently and in duplicate, to identify relevant articles and categorized these into its associated PICO question(s). We included, published full articles or abstracts with any *controlled* study design (randomized, cluster-randomized, before-after, case-control, or cohort designs) that presented original data that addressed the Population, Intervention, and Comparison for each PICO. Discordances were resolved by consensus and disagreements were adjudicated by a third reviewer from among the same team of reviewers.

**2. Data Extraction**

One reviewer then extracted data into a pre-formatted data abstraction form and assessed study risk of bias for all articles included in each PICO question. For each included article, we recorded study characteristics and outcome data, numerically where available or narratively (as a statement summarizing the direction of the effect) where numerical data were not reported. A second reviewer then confirmed the accuracy and completeness of the data extracted.

**3. Data Synthesis**

For each PICO question, one of the two methodologists synthesized the data and generated a GRADE evidence profile. Where possible, meta-analysis was performed using [dataparty.ca](http://dataparty.ca), a novel web-based meta-analysis platform. For meta-analyses, we used random-effects model to pool the estimate of effects across included studies and reported risk ratio (RR) with accompanying 95% confidence interval (CI) to summarize the intervention effects for binary outcomes and mean difference with 95% CI to summarize intervention effects for continuous outcomes. We elected to use random-effects models due to anticipated heterogeneity in the evidence and outcomes, especially in this research area given clinical heterogeneity in hospital systems, MET team organization, and outcomes assessed. Statistical heterogeneity was assessed using Chi-squared and I-squared tests. Where data were insufficient for meta-analysis, evidence was summarized narratively.

**Supplemental Digital Content 7. GRADE Methodology**

**1. Certainty in the evidence.** We used well-established GRADE approaches to determine overall certainty in the evidence separately for each outcome. One of the clinician-methodologists then generated an Evidence Profile using the GDT software ([www.GRADEPRO.com](http://www.gradepro.com)). In the GRADE approach, randomized controlled trials are initially considered to yield ‘high’ certainty evidence, which may then be downgraded if there are concerns around one or more of the following domains: (1) risk of bias, (2) inconsistency, (3) indirectness of the evidence, (4) imprecision, and (5) ‘other’ factors, which includes publication bias, presence of a dose-response relationship, magnitude of the effect, assessment of the effect of plausible residual confounding or bias. Non-randomized studies are initially considered to yield ‘low’ certainty evidence, which may then be upgraded or further downgraded based on the assessment of the same 5 domains. The certainty of the evidence for each outcome was then categorized as ‘high’, ‘moderate’, ‘low’, or ‘very low’:

|  |  |
| --- | --- |
| **Certainty Level** | **Description** |
| ⊕⊕⊕⊕  High | We are very confident that the true effect lies close to that of the estimate of the effect. |
| ⊕⊕⊕◯  Moderate | We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of that effect, but there is a possibility that it is substantially different. |
| ⊕⊕◯◯  Low | Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect. |
| ⨁◯◯◯  Very Low | We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect. |

**2. Evidence-to-Decision Framework**

For each PICO question, panel members held one or more web-based meetings via Zoom video conferencing platform, to review the Evidence Profile, discuss the evidence and various factors that may influence decision-making, and to generate a recommendation. The GRADE Evidence-to-Decision (EtD) framework was used to help organize panel discussions during deliberation meetings. The EtD incorporates panel judgment across 12 domains:

|  |  |
| --- | --- |
| **Domain** | **Question** |
| **Priority of the Problem** | Is the problem a priority? |
| **Desirable effects** | How substantial are the desirable effects? |
| **Undesirable effects** | How substantial are the undesirable effects? |
| **Certainty of evidence** | What is the overall certainty of the evidence of effects? |
| **Values** | Is there important uncertainty or variability in how much people value the main outcome? |
| **Balance of effects** | Does the balance between desirable and undesirable effects favor the intervention or the comparison? |
| **Resources required** | How large are the resource requirements (costs)? |
| **Certainty of evidence of required resources** | What is the certainty of the evidence of resource requirements (costs)? |
| **Cost effectiveness** | Does cost-effectiveness of the intervention favor the intervention or the comparison? |
| **Equity** | What would be the impact on health equity? |
| **Acceptability** | Is the intervention acceptable to key stakeholders? |
| **Feasibility** | Is the intervention feasible to implement? |

**3. Recommendation Generation**

After reviewing the Evidence Profile and discussing each consideration in the EtD for a PICO question, the panel deliberated and decided on a recommendation direction (for, against, neutral) and strength (strong vs. conditional). By convention, strong recommendations are phrased as “We recommend…” and conditional recommendations as “We suggest…”. The description of recommendation strengths and their implications for patients, clinicians, and policy makers are shown in **Table 1**.

**Supplemental Digital Content 8. Good Practice Statements**

Good Practice Statements are considered to reflect strong but ungraded (not following the formal GRADE process) recommendations. Consistent with GRADE methodology, we generated a Good Practice Statement if the systematic review identified no relevant literature addressing a PICO question and appropriate indirect evidence was not available, and when the panel judged that the criteria for Good Practice Statements as listed below were met.

|  |
| --- |
| **Criteria for Good Practice Statements** |
| 1. Is the statement clear and actionable? |
| 2. Is the message necessary? |
| 3. Is the net benefit (or harm) large and unequivocal? |
| 4. Is the evidence difficult to collect and summarize? |
| 5. If a public health guideline, are there specific issues that should be considered (e.g., equity)? |
| 6. Have you made the rationale explicit? |
| 7. Is this better to be formally GRADEd? |

**Supplemental Digital Content 9. Final Voting Process**

After all draft recommendations were generated, all panel members, except the clinician-methodologists, were electronically polled to indicate their agreement with each recommendation. The poll for each recommendation consisted of the PICO question, the draft recommendation statement, and a Rationale drafted by guideline leadership. Panelists were asked to select from three options: ‘Agree’, ‘Disagree’, or ‘Abstain’. An opportunity was provided to provide comments to explain their selection for each recommendation and these were reviewed and where appropriate, addressed by panel leadership. Panel members with conflicts of interest for a particular question were asked to Abstain from voting on the associated recommendation. Based on SCCM requirements, consensus was defined as 80% agreement among at least 75% of panel members, excluding those who abstained.

**Voting Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Recommendation** | **Response Rate (%)** | **Yes (%)** | **No (%)** | **Abstain (%)** |
| 1. Ward staff caring for hospitalized patients should strive to acquire a complete and accurate set of vital signs when ordered and when there is additional cause for concern, and to escalate the reporting of significant abnormalities to the appropriate clinicians in an urgent manner. | 100% | 96% | 0% | 4% |
| 2. We **make no recommendation** regarding the routine use of continuous vital sign monitoring to recognize early clinical deterioration in *unselected* non-ICU patients. | 100% | 100% | 0% | 0% |
| 3. We **suggest** focused education of direct-care non-ICU hospital clinicians on recognizing early clinical deterioration. | 100% | 100% | 0% | 0% |
| 4A. Patients, families, and care partners of hospitalized patients are able to recognize subtle differences in clinical status that may signify deterioration and should be empowered to alert appropriate personnel including the Rapid Response System. | 100% | 96% | 4% | 0% |
| 4B. We **suggest** that patient, family, and care partner concerns be incorporated into hospital early warning systems. | 100% | 91% | 4% | 4% |
| 5. We **recommend** hospital-wide deployment of Rapid Response Systems (i.e., RRT/MET) for non-ICU patients that includes explicit activation criteria for obtaining help from a designated response team. | 100% | 91% | 4% | 4% |
| 6. We make **no recommendations** regarding **(1)** whether a RRT/MET should be led by a ‘prescribing clinician’ versus a ‘non-prescribing clinician;’ and **(2)** whether a RRT/MET should be led by a physician as compared to other healthcare providers. | 100% | 91% | 4% | 4% |
| 7A. We make **no recommendation** about involvement of palliative care trained personnel as part of a RRT/MET. | 100% | 100% | 0% | 0% |
| 7B. We **suggest** ensuring that responding clinicians have expertise on eliciting patients' goals of care and establishing treatment plans that best reflect their wishes and prognoses. | 100% | 91% | 4% | 4% |
| 8. A process for quality improvement should be part of a Rapid Response System. | 100% | 91% | 4% | 4% |

**10. Evidence profiles and forest plots**

[A. Continuous vital sign monitoring in all *unselected* non-ICU patients](#bookmark=id.9rduzpl21hao)

[B. Focused education on recognition of early clinical deterioration](#bookmark=kix.uwrhjq727zxl)

[C. Patient and family activation of rapid Response team](#bookmark=kix.1mi2ph2e6hsw)

[D. Explicit activation criteria and rapid response team/ medical emergency team](#bookmark=kix.qjxwrf9a77t)

[E. Rapid response team leadership](#bookmark=kix.w7pv5ykgjppu)

[F. Palliative care personnel as part of the RRT and/or education of RRT personnel in eliciting patients’ goals of care](#bookmark=kix.ofitwibjneuj)

**Supplemental Digital Content 10A**

**Question: Should continuous vital sign monitoring compared to no continuous vital sign monitoring be used in all *(unselected)* patients hospitalized outside the ICU?**

**Forest Plots**

**Table

Description automatically generated with low confidence**

**Table

Description automatically generated**

**Table

Description automatically generated**

**GRADE Evidence Profile**

| **Certainty assessment** | | | | | | | **№ of patients** | | **Effect** | | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | **continuous VS monitoring** | **no continuous VS monitoring** | **Relative (95% CI)** | **Absolute (95% CI)** |
| **Hospital mortality [randomized trials]** | | | | | | | | | | | | |
| 2 | randomised trials | **serious a** | not serious | not serious | **very**  **serious b** | none | 41/341 (12.0%) | 43/287 (15.0%) | **RR 0.94** (0.64 to 1.38) | **9 fewer per 1,000** (from 54 fewer to 57 more) | ⨁◯◯◯ Very low | CRITICAL |
| **Mortality/ unexpected deaths [observational studies]** | | | | | | | | | | | | |
| 7 | observational studies | not serious | **serious c** | not serious | not serious | none | Among 7 observational before-after studies, **3 found decreased mortality rate** with continuous VS monitoring compared to intermittent (Subbe 201717; Scott Evans 201518; Bellomo 201220) and **4 found no change in mortality** (Xie 201915; Weller 201823; Brown 201424; Verrillo 201925). Variability in how the outcome was reported across studies did not allow for numerical pooling of the data. **Overall, we are uncertain as to the effect of continuous VS monitoring on mortality among hospitalized patients outside in the ICU.** | | | | ⨁◯◯◯ Very low | CRITICAL |
| **Cardiac arrest outside the ICU [randomized trials]** | | | | | | | | | | | | |
| 2 | randomised trials | **serious a** | not serious | not serious | **very**  **serious b** | none | 9/325 (2.8%) | 11/327 (3.4%) | **RR 0.83** (0.36 to 1.91) | **6 fewer per 1,000** (from 21 fewer to 29 more) | ⨁◯◯◯ Very low | CRITICAL |
| **Cardiac arrests outside of the ICU [observational studies]** | | | | | | | | | | | | |
| 6 | observational studies | not serious | not serious | not serious | not serious | none | Among 6 observational before-after studies that reported hospital mortality or unplanned deaths, **5 found decreased rates of cardiac arrest outside the ICU** with continuous VS monitoring compared to intermittent VS monitoring (Subbe 201717; Heller 202019; Zimlichman 201221; Long 201622; Brown 201424), whereas **one study found no change** (Bellomo 201220). Overall, rates of cardiac arrest outside the ICU were low (< 1%) across all studies. Variability in how the outcome was reported across studies did not allow for numerical pooling of the data. **Overall, we are uncertain as to the effect of continuous VS monitoring on cardiac arrest rates among hospitalized patients outside the ICU.** | | | | ⨁⨁◯◯ Low | CRITICAL |
| **Unplanned transfers to ICU [randomized trials]** | | | | | | | | | | | | |
| 3 | randomised trials | **serious a** | not serious | not serious | **very**  **serious b** | none | 13/465 (2.8%) | 12/413 (2.9%) | **RR 0.99** (0.46 to 2.1) | **0 fewer per 1,000** (from 16 fewer to 32 more) | ⨁◯◯◯ Very low | IMPORTANT |
| **Unplanned transfers to ICU [observational studies]** | | | | | | | | | | | | |
| 8 | observational studies | not serious | not serious | not serious | not serious | none | Among 8 observational before-after studies that reported hospital mortality or unplanned deaths, all **reported no change in the rate of unplanned/ emergency transfers to higher level of care (e.g., ICU).** Variability in how the outcome was reported across studies did not allow for numerical pooling of the data. **Overall, we are uncertain as to the effect of continuous VS monitoring on transfers to higher level of care settings (e.g., ICU) among hospitalized patients.** | | | | ⨁⨁◯◯ Low | IMPORTANT |
| **ICU length of stay [observational studies]** | | | | | | | | | | | | |
| 2 | observational studies | not serious | not serious | not serious | not serious | none | **There were no RCTs evaluating this outcome.** Two observational before-after studies **found decreased ICU length of stay** with continuous VS monitoring compared to intermittent VS monitoring (Zimlichman 201221; Brown 201424). Variability in how the outcome was reported across the 2 studies did not allow for numerical pooling of the data. **Continuous VS monitoring may be associated with decreased ICU length of stay, although there is low certainty in the evidence.** | | | | ⨁⨁◯◯ Low | IMPORTANT |
| **Time from recognition to (or delays in) response by RRT/MET [observational studies]** | | | | | | | | | | | | |
| 2 | observational studies | not serious | **serious c** | not serious | not serious | none | **There were no RCTs evaluating this outcome.** Among 2 observational before-after studies that reported this outcome, **one reported decreased** delayed in RRT activations (Barwise 201516), and **another reported no change** in duration of event prior to RRT arrival on scene (Heller 202019) with continuous VS monitoring compared to intermittent VS monitoring. **Overall, we are uncertain as to the effect of continuous VS monitoring on time to RRT/MET response among hospitalized patients outside the ICU.** | | | | ⨁◯◯◯ Very low | IMPORTANT |
| **Time to (or delays in) implementation of appropriate treatment (assessed with ‘time to administer antibiotics in sepsis’) [randomized trials]** | | | | | | | | | | | | |
| 1 | randomised trial | **serious a** | not serious | not serious | **serious d** | none | 22 | 12 | MD **386.8 mins lower** (847 lower to 73.4 higher) | | ⨁◯◯◯ Very low | IMPORTANT |
| **Changes in goals of care/ resuscitation status [observational studies]** | | | | | | | | | | | | |
| 2 | observational studies | not serious | **serious c** | not serious | not serious | none | **There were no RCTs evaluating this outcome.** Among 2 observational before-after studies that reported this outcome, **one reported decreased** number of patients with DNAR status (Subbe 201717) and **another reported no change** (Bellomo 201220) after first notification/ alert in the continuous VS monitoring cohort. **Overall, we are uncertain as to the effect of continuous VS monitoring on changes in GOC among hospitalized patients.** | | | | ⨁◯◯◯ Very low | IMPORTANT |

**VS:** vital sign; **MD:** mean difference; **RR:** risk ratio; **RRT:** Rapid response team; **MET:** Medical emergency team; **ICU:** Intensive care unit; **RCT:** Randomised controlled trial; **DNAR:** Do Not Attempt Resuscitation; **GOC:** Goals of care

#### Explanations

a. Rated down for risk of bias due to unblinded trial design with potential influence on healthcare provider monitoring of patients outside of the trial interventions.

b. Rated down for imprecision due to wide confidence interval.

c. Rated down for inconsistency due to variability in conclusions across studies.

d. Rated down for imprecision due to wide confidence interval and small sample size in one trial.

e. Rated down for indirectness due to variability in 'complications' reported. Defined as any 'adverse event' from a list of complications in one study (Subbe et al., 201717) and as 'complications' such as sepsis, obstructive sleep apnea, and pulmonary embolism by another study (Verrillo et al., 201925).

# Summary of Judgements: Continuous vital sign monitoring in all (unselected) patients

|  | **JUDGMENT** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | Moderate | Large |  | Varies | **Don't know** |
| **UNDESIRABLE EFFECTS** | Large | Moderate | Small | Trivial |  | Varies | **Don't know** |
| **CERTAINTY OF EVIDENCE** | **Very low** | Low | Moderate | High |  |  | No included studies |
| **VALUES** | Important uncertainty or variability | Possibly important uncertainty or variability | Probably no important uncertainty or variability | **No important uncertainty or variability** |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **Don't know** |
| **RESOURCES REQUIRED** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | **Varies** | Don't know |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **No included studies** |
| **EQUITY** | Reduced | Probably reduced | Probably no impact | Probably increased | Increased | **Varies** | Don't know |
| **ACCEPTABILITY** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |
| **FEASIBILITY** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |

# Type of Recommendation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | **Conditional recommendation for either the intervention or the comparison** | Conditional recommendation for the intervention | Strong recommendation for the intervention |
| ○ | ○ | **✓** | ○ | ○ |

**Supplemental Digital Content 10B**

**Question:** **Should we provide focused education for non-ICU staff on early recognition of clinical deterioration compared with no focused education?**

**GRADE Evidence Profile**

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Hospital mortality** | | | | | | | | | | |
| 17 | 1 randomised trial  16 observational studies | not serious | **serious a** | **serious b** | not serious | none | Among 17 studies (1 cluster RCT, 16 before-after), 11 reported a decreased hospital mortality with focused education on early clinical deterioration while 6 studies showed no effect. However, the education was often part of a package that included implementation RRT/MET with explicit activation criteria. One cluster RCT (MERIT trial) conducted at 12 hospitals in Australia failed to show any impact on hospital mortality with education as part of a package that included explicit activation criteria and RRT/MET. **The overall effect of focused education on mortality is uncertain.** | ⨁◯◯◯ Very Low | | CRITICAL |
| **Cardiac arrests outside of the ICU** | | | | | | | | | | |
| 12 | 1 randomised trial  11  observational studies | not serious | **serious a** | **serious b** | not serious | none | Among 12 studies (1 cluster RCT, 11 before-after studies), 8 reported decreased non-ICU cardiac arrests with focused education on early clinical deterioration, while 4 reported no effect. However, the education was often part of a package that included implementation RRT/MET with explicit activation criteria. One cluster RCT (MERIT trial) conducted at 12 hospitals in Australia failed to show any impact on cardiac arrests with education as part of a package that included explicit activation criteria and RRT/MET. **The overall effect of focused education on cardiac arrest outside the ICU is uncertain.** | ⨁◯◯◯ Very Low | | CRITICAL |
| **ICU Length of Stay** | | | | | | | | | | |
| 3 | observational studies | not serious | not serious | **serious b** | not serious | **strong association** | All 3 before-after studies demonstrated a reduction in ICU length of stay with focused education. As with other outcomes, the education was often part of a package that included implementation RRT/MET with explicit activation criteria contributing to less certainty about the effect of the education specifically in improving outcomes. | ⨁⨁◯◯ Low | | IMPORTANT |
| **Hospital Length of Stay** | | | | | | | | | | |
| 5 | observational studies | not serious | **serious c** | **serious b** | not serious | none | Three of 5 before-after studies reported decreased hospital length of stay post-intervention (2 among all patients, 1 only reported for patients with a RRT/MET call). One study found no change in hospital length of stay and another study reported increased length of stay, possibly due to decreased mortality in the post-intervention period. The overall effect of focused education on hospital length of stay is uncertain. | ⨁◯◯◯ Very Low | | IMPORTANT |
| **Unplanned transfers to ICU** | | | | | | | | | | |
| 9 | 1 randomised trial  8  observational studies | not serious | not serious | **serious b** | not serious | none | Among 9 studies (1 cluster RCT, 8 before-after studies), 3 reported a decrease in unplanned transfers to ICU, whereas one reported an increase and 5 reported no effect. The cluster RCT (MERIT trial) also failed to demonstrate an impact on ICU transfers. Overall, based on low certainty evidence, there is possibly no effect on transfers to higher level care with focused education. | ⨁◯◯◯ Very Low | | IMPORTANT |
| **Time from recognition to response by RRT/MET** | | | | | | | | | | |
| 1 | observational study | not serious | not serious | **serious b** | not serious | none | One before-after study found decreased time from RRT/MET activation to RRT/MET physician review (pre-intervention: 45 minutes, post-intervention: 30 minutes). | ⨁◯◯◯ Very Low | | IMPORTANT |
| **Compliance with applying EWS** | | | | | | | | | | |
| 4 | observational studies | not serious | not serious | **serious b** | not serious | **strong association** | Four before-after studies reported increased compliance with early warning score calling criteria. | ⨁⨁◯◯ Low | | IMPORTANT |
| **Changes in goals of care/ resuscitation status** | | | | | | | | | | |  |
| 1 | observational studies | not serious | not serious | **serious b** | not serious | none | One before-after study found no difference in the pre- and post-implementation likelihood of DNAR status among non-survivors with an initial return of spontaneous circulation after cardiac arrest (76% vs. 75%). | | ⨁◯◯◯ Very Low | IMPORTANT |  |

**RCT:** randomised controlled trial; **ICU:** Intensive care unit; **RRT:** Rapid response team; **MET:** Medical emergency team; **DNAR:** Do not attempt resuscitation

#### Explanations

a. Rated down for inconsistency due to the discrepancy between the lower quality before-after studies and the higher quality RCT.

b. Rated down for indirectness because the intervention was variable across included studies and was often part of a package that included RRT, EWS, education, and quality improvement/ auditing processes, which makes it difficult to ascertain exactly what effect was related to the educational component.

c. Rated down for inconsistency due to variability in conclusions across studies.

# Summary of Judgements: Focused education on early recognition of clinical deterioration

|  | **JUDGMENT** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | Moderate | **Large** |  | Varies | Don't know |
| **UNDESIRABLE EFFECTS** | Large | Moderate | **Small** | Trivial |  | Varies | Don't know |
| **CERTAINTY OF EVIDENCE** | Very low | **Low** | Moderate | High |  |  | No included studies |
| **VALUES** | Important uncertainty or variability | Possibly important uncertainty or variability | Probably no important uncertainty or variability | **No important uncertainty or variability** |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | Don't know |
| **RESOURCES REQUIRED** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | Varies | **Don't know** |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | No included studies |
| **EQUITY** | Reduced | Probably reduced | Probably no impact | Probably increased | Increased | Varies | **Don't know** |
| **ACCEPTABILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **FEASIBILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |

# Type Of Recommendation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | **Conditional recommendation for the intervention** | Strong recommendation for the intervention |
| ○ | ○ | ○ | **✓** | ○ |

**Supplemental Digital Content 10C**

**Question: Should patient and/ or family activation of rapid response team/ medical emergency team be included as a formal part of an early warning system as compared to no formal inclusion?**

## GRADE Evidence Profile

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Mortality** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | not serious | none | One before-after study (**Gerdik 201053**) reported a decrease in mortality, from 22.9/ 1000 admissions to 9.6/ 1000 admissions (95% CI, 5.4 to 13.8) after the widespread implementation of patient/ family activated RRT/MET at a level 1 trauma centre. | ⨁⨁◯◯ Low | CRITICAL |
| **Cardiac arrests outside ICU** | | | | | | | | | |
| 3 | observational studies | not serious | not serious | not serious | not serious | none | Two before-after studies (**Gerdik 201053, McCawley 201351**) reported a non-statistically significant decrease in rates of cardiac arrest outside ICU (from 4.5 to 3 per 1000 discharges, p > 0.05). Another before-after study performed at a pediatric centre (**Brady 201452**) reported no change in rates of cardiac arrest outside ICU but found that 3 of 8 RRT-preventable codes had a family concern documented in the chart but without an RRT/MET activation. | ⨁⨁◯◯ Low | CRITICAL |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Unsuccessful resuscitations after cardiac arrest** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | not serious | none | One before-after study (**Gerdik 201053**) reported a decrease in the number of unsuccessful resuscitation events (codes) from 5.9 to 3.1 per month, after the widespread introduction of patient/ family activated RRT/MET at a level 1 trauma centre. | ⨁⨁◯◯ Low | CRITICAL |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Unplanned transfers to ICU** | | | | | | | | | |
| 2 | observational study | not serious | **serious a** | not serious | not serious | none | One before-after study (**Gerdik 201053**) reported an increase in transfers to higher level of care (12.8 to 45.4 per month, p < 0.05). **McCawley (2013)51** reported a decrease in the rate of unplanned transfers to ICU (46.8% to 33.8%, p > 0.05). | ⨁◯◯◯ Very Low | CRITICAL |

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Number of RRT/MET activations** | | | | | | | | | |
| 4 | observational studies | not serious | **serious a** | not serious | not serious | none | Four before-after studies reported RRT/MET calls before and after the introduction of patient/ family RRT/MET activation.  Two studies showed an increase:   * **Gerdik (2010)53** reported an increase from 47 to 193 RRT/MET activations per month. * **McCawley (2013)51** reported an increase from 22 to 36 activations per 1000 discharges.   Two studies showed no change:   * **Zix (2012)50** reported no change in the number of RRT/MET activations after the implementation of family (parent) RRT/MET activation in a pediatric centre (numerical change not reported). In this study, family activation accounted for 0.7% of all activations. * Finally, **Hueckel (2012)54** reported an increase from 40 to 47 activations in the 12 weeks before and 12 weeks after the implementation of family RRT/MET activation, but only 2 of 47 RRT/MET calls were activated by family members. | ⨁◯◯◯ Very Low | NOT IMPORTANT |

**Accuracy in recognizing clinical deterioration**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | observational study | not serious | not serious | not serious | not serious | **strong association** | Three before-after studies reported the proportion of RRT/MET calls that led to transfer to a higher level of care:   * **Zix (2012)50**: 59% for staff activations and 25% for family activations. * **McCawley (2013)51**: 46.8% for staff activations and 33.8% for family activations. * **Brady (2014)52:** Two independent reviewers adjudicated ‘accuracy’ of activations in identifying clinical deterioration and reported a kappa of 0.67 for family activations and a kappa of 0 (almost perfect correlation) for staff activations. | ⨁⨁⨁◯ Moderate | NOT IMPORTANT |

**RRT:** Rapid response team; **MET:** Medical emergency team; **MD:** mean difference; **RR:** risk ratio

**Explanations**

a. Rated down for inconsistency due to variability in findings across studies.

# Summary of Judgements: Formal incorporation of patient/ family concerns into early warning systems

|  | **JUDGMENT** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | Moderate | Large |  | **Varies** | Don't know |
| **UNDESIRABLE EFFECTS** | Large | Moderate | Small | **Trivial** |  | Varies | Don't know |
| **CERTAINTY OF EVIDENCE** | Very low | **Low** | Moderate | High |  |  | No included studies |
| **VALUES** | **Important uncertainty or variability** | Possibly important uncertainty or variability | Probably no important uncertainty or variability | No important uncertainty or variability |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | Don't know |
| **RESOURCES REQUIRED** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | Varies | **Don't know** |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **No included studies** |
| **EQUITY** | Reduced | Probably reduced | Probably no impact | Probably increased | Increased | **Varies** | Don't know |
| **ACCEPTABILITY** | No | Probably no | Probably yes | Yes |  | **Varies** | Don't know |
| **FEASIBILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |

# Type of Recommendation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | **Conditional recommendation for the intervention** | Strong recommendation for the intervention |
| ○ | ○ | ○ | **✓** | ○ |

**Supplemental Digital Content 10D**

## Question: Should we implement explicit activation criteria and rapid response teams to identify and respond to patients deteriorating outside the ICU?

## Forest Plots

Calendar

Description automatically generated

Table

Description automatically generated with medium confidence

A picture containing calendar

Description automatically generated

A picture containing table

Description automatically generated

## GRADE Evidence Profile

| **Certainty assessment** | | | | | | | | **№ of units randomized** | | | **Impact** | | **Certainty** | | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies**  **Study design** | **Risk of bias** | | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | | **RRT/ EWS** | | **No**  **RRT/ EWS** |
| **Unexpected deaths per 1000 admissions - pooled** | | | | | | | | | | | | | | | |
| 2 randomised trials | not serious | | not serious | not serious | **serious a** | none | | 40 | 39 | | MD **0.14 per 1000 lower** (0.43 lower to 0.15 higher) | | ⨁⨁⨁◯ Moderate | | CRITICAL |
| **Mortality - pooled** | | | | | | | | | | | | | | | |
| 3 randomised trials | not serious | | not serious | not serious | **serious b** | none | | 550/14,523 (3.8%) | 578/11,197 (5.2%) | | **RR 0.74** (0.66 to 0.83) | **13 fewer per 1,000** (from 18 fewer to 9 fewer) | ⨁⨁⨁◯ Moderate | | CRITICAL |
| **Unexpected deaths/ mortality - not pooled** | | | | | | | | | | | | | | | |
| 79 observational studies | not serious | | **serious c** | not serious | not serious | none | | Among 79 observational studies, 45 studies (57%) reported a reduction in unexpected deaths/ mortality with implementation of activation criteria/ RRT, 30 studies (41%) reported no change, and 2 reported an increase. Subgroup analysis examining activation criteria only, RRT/MET only, or a combination of these interventions was not possible given the heterogeneity in data. | | | | | ⨁◯◯◯ Very Low | | CRITICAL |
| **Cardiac arrests outside ICU per 1000 admissions - pooled** | | | | | | | | | | | | | | | |
| 2 randomised trials | not serious | | not serious | not serious | **serious a** | none | | 40 | 39 | | MD **0.43 per 1000 lower** (0.88 lower to 0.02 higher) | | ⨁⨁⨁◯ Moderate | | CRITICAL |
| **Cardiac arrests outside ICU - not pooled** | | | | | | | | | | | | | | | |
| 2 randomised trials  67 observational studies | not serious | | **serious c** | not serious | not serious | none | | Two additional RCTs (Jeddian et al., 201660; YekeFallah et al., 201858) showed no effect on cardiac arrest rates with the implementation of RRT/MET.  Amongst 67 observational studies, 41 studies (61%) reported a reduction in cardiac arrest with implementation of activation criteria +/- RRT/MET, whereas 26 (39%) reported no change. No studies reported an increase in cardiac arrest rates. Subgroup analysis examining activation criteria only, RRT/MET only, or a combination of these interventions was not possible given the heterogeneity in data. | | | | | ⨁◯◯◯ Very Low | | CRITICAL |
| **Quality of life - not pooled** | | | | | | | | | | | | | | | |
| 1 observational study | not serious | | not serious | not serious | not serious | none | | One observational study (Simmes et al., 2013)143 reported no change in health-related quality of life with implementation of RRT/MET among surgical patients at 3 and 6 months. | | | | | ⨁⨁◯◯ Low | | CRITICAL |
| **Discharge to assisted living - not pooled** | | | | | | | | | | | | | | | |
| 2 observational studies | not serious | | not serious | not serious | not serious | none | | Two observational studies (Angel et al., 201668; Umscheid et al., 2015153) reported no change in rates of discharge to assisted living with implementation of RRT/MET with or without activation criteria. | | | | | ⨁⨁◯◯ Low | | CRITICAL |
| **Unplanned transfers to ICU per 1000 admissions - pooled data** | | | | | | | | | | | | | | | |
| 2 randomised trials | **serious d** | | not serious | not serious | **serious e** | none | | 40 | 39 | | MD **0.59 per 1000 higher** (2.57 lower to 3.74 higher) | | ⨁⨁◯◯ Low | | IMPORTANT |
| **Unplanned transfers to ICU - not pooled** | | | | | | | | | | | | | | | |
| 3 randomised trials  40 observational studies | **serious d** | | **serious c** | not serious | not serious | none | | Among 3 additional RCTs, 2 showed a decrease in rates of transfers to ICU (Ludikhuize et al., 201456; YekeFallah et al., 201858) and one showed no effect (Jeddian et al., 201687) with the implementation of activation criteria and/ or RRT/MET.  Amongst 40 observational studies, 16 studies (40%) reported a decrease in transfers to ICU, whereas 5 studies (12%) reported an increase and 19 (48%) reported no change. Subgroup analysis examining activation criteria only, RRT only, or a combination of these interventions was not possible given the heterogeneity in data. | | | | | ⨁◯◯◯ Very Low | | IMPORTANT |
| **Changes in goals of care/ comfort care orders - not pooled** | | | | | | | | | | | | | | | |
| 5 observational studies | | not serious | **serious c** | not serious | not serious | none | Amongst 5 observational studies, 2 reported an increase in rates of change in goal of care and 3 reported no change with the implementation of activation criteria and/ or RRT/MET. | | | | | | ⨁◯◯◯ Very Low | IMPORTANT | |
| **Spiritual care/Chaplain visits during hospital stay - not pooled** | | | | | | | | | | | | | | | |
| 2 observational studies | | not serious | not serious | not serious | not serious | none | One study (Vazquez et al., 2009154 reported increased rates of spiritual care visits and another study (Downar et al., 2013158) reported decreased rates after the implementation of RRT/MET. | | | | | | ⨁⨁◯◯ Low | IMPORTANT | |
| **Hospital length of stay - not pooled** | | | | | | | | | | | | | | | |
| 3 randomised trials  13 observational studies | | not serious | **serious c** | not serious | not serious | none | Three RCTs showed no effect on hospital length of stay (Ludikhuize et al., 201456; Priestley et al., 200459; Jeddian et al., 201660) with the implementation of activation criteria and/ or RRT/MET.  Amongst the 13 before-after cohort studies examining this outcome, 3 reported a reduction, 2 reported an increase, and 8 reported no change in hospital length of stay. Subgroup analysis examining activation criteria only, RRT only, or a combination of these interventions was not possible given the heterogeneity in data. | | | | | | ⨁◯◯◯ Very Low | IMPORTANT | |

**MD:** mean difference; **RR:** risk ratio; **RCT:** randomised controlled trial; **ICU:** Intensive care unit; **RRT:** Rapid response team; **MET:** Medical emergency team

#### Explanations

a. Rated down for imprecision due to relatively small sample sizes (small number of hospitals).

b. Rated down for imprecision due to small event rates across studies.

c. Rated down for inconsistency due to variability in findings across studies.

d. Rated down for risk of bias due to outcome measurement as decisions to transfer to ICU may be subjective and vary by practitioners/ local practice.

e. Rated down for imprecision due to wide confidence interval.

# Summary of Judgements: Explicit activation criteria/ rapid response teams

|  | **JUDGMENT** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | **Moderate** | Large |  | Varies | Don't know |
| **UNDESIRABLE EFFECTS** | Large | Moderate | Small | **Trivial** |  | Varies | Don't know |
| **CERTAINTY OF EVIDENCE** | Very low | Low | **Moderate** | High |  |  | No included studies |
| **VALUES** | Important uncertainty or variability | Possibly important uncertainty or variability | Probably no important uncertainty or variability | **No important uncertainty or variability** |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | **Favors the intervention** | Varies | Don't know |
| **RESOURCES REQUIRED** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | **Varies** | Don't know |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  | **Varies** | No included studies |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | No included studies |
| **EQUITY** | Reduced | Probably reduced | Probably no impact | Probably increased | Increased | Varies | Don't know |
| **ACCEPTABILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **FEASIBILITY** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |

# Type of Recommendation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | Conditional recommendation for the intervention | **Strong recommendation for the intervention** |
| ○ | ○ | ○ | ○ | **✓** |

**Supplemental Digital Content 10E**

## Question A: Should rapid response teams/ medical emergency teams be led by a ‘prescribing’ as compared to a ‘non-prescribing’ clinician?

## GRADE Evidence Profile

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Hospital mortality** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | **serious a** | none | One before-after study (**Chassan et al., 2013\*)161** of 50 RN-led to 50 ACNP-led RRT/MET calls, in which patients were matched on age, comorbidities, and illness severity, found survival to hospital discharge was higher in RN-led (94%) compared to ACNP-led (82%) RRT/MET call patients. **However, imprecision, low numbers, and confounding led to an uncertain effect overall on hospital mortality.** | ⨁◯◯◯ Very Low | CRITICAL |
| **Hospital Length of Stay** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | **serious a** | none | **Chassan et al., 2013\*161** of 50 RN-led to 50 ACNP-led RRT/MET calls, in which patients were matched on age, comorbidities, and illness severity, reported no difference in hospital length of stay between ACNP-led (9 +/- 9 days) compared with RN-led (7 +/- 6 days) RRT/MET call patients. | ⨁◯◯◯ Very Low | IMPORTANT |
| **Unplanned transfers (escalations) to higher level of care** | | | | | | | | | |
| 1 | observational study | **serious b** | **serious c** | **serious d** | not serious | none | **Chassan et al., 2013\*161** reported more ICU transfers after introduction of an ACNP-led RRT/MET. Conversely, **Hatlem et al., 2011\*\*93** found that unplanned ICU transfers were 25% higher before the introduction of a ‘Rounding RN’ as an extension of the RRT/MET (which included a hospitalist without a ‘Rounding RN’). | ⨁◯◯◯ Very Low | IMPORTANT |

**ACNP:** Advanced Care Nurse Practitioner; **RRT:** Rapid response team; **MET:** Medical emergency team; **RN:** Registered Nurse

#### \* Chassen et al. (2013)161 also reported more code status discussions, more interventions documented, and fewer > 1 RRT calls during the hospital stay in ACNP-led calls.

#### \*\* Hatlem et al. (2011)93 compared an RRT that consisted of an ICU RN, a hospitalist, a respiratory therapist, and an RN Clinical Administrator (‘before’ group) with the addition of a ‘Rounding RN’ as an extension of the existing RRT working synergistically with the RRT with the goal of increasing RRT utilization by having a non-MD as the first point of contact (‘after’ group).

#### Explanations

## a. Rated down for imprecision due to the small numbers.

## b. Rated down for risk of bias due to lack of adjustment for potential baseline differences between the pre and post cohorts.

c. Rated down for inconsistency in findings between the two studies.

## d. Rated down for indirectness because the groups compared were related to the existence of a ‘Rounding RN’ as the first point of contact, rather than a prescribing vs. non-prescribing provider led-RRT.

## Question B: Should rapid response teams/medical emergency teams be led by a physician as compared to a non-physician?

## GRADE Evidence Profile

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Hospital mortality** | | | | | | | | | |
| 2 | observational studies | **serious a** | **serious b** | not serious | not serious | none | One cohort study (**Gupta et al., 2021**)162 of 1343 RRT/MET activations found higher hospital mortality among patients who had an ICU Registrar-led (20.5%) vs. NP-led (12.5%) RRT/MET, including in propensity-score matched analysis. The same study also reported a lower proportion of patients ‘discharged home’ in patients with Registrar-led (45.6%) vs. NP-led (56.2%) in propensity-score matched analysis. Conversely, another cohort study (**Scherr et al., 2012**)137 found no difference in patient deaths between intensivist-led (1 of 25) and NP-led RRT/MET (2 of 178). **Overall, given the inconsistency and issues related to risk of bias, we are uncertain about the effect of having a physician-led RRT/MET on mortality.** | ⨁◯◯◯ Very Low | CRITICAL |
| **Cardiac arrests** | | | | | | | | | |
| 3 | observational studies | **serious a** | not serious | not serious | not serious | none | A before-after study (**Rubis et al., 2013**) that compared physician-led vs. ACNP-led RRTs reported no difference in rates of cardiac arrest. A cohort study (**Gupta et al., 2021**)162 of 1343 MET activations found no difference in cardiac arrest among patients who had an ICU Registrar-led (0.4%) vs. NP-led RRT (0.3%), although the number of overall events was low (n = 4). Another cohort study (**Scherr et al., 2012**)137 found no difference in cardiac arrest rates between intensivist-led (0 of 25) and NP-led RRTs (4 of 178). **Overall, given the high risk of bias across studies, we are uncertain about the effect of having a physician-led RRT/MET on cardiac arrests.** | ⨁◯◯◯ Very Low | CRITICAL |
| **Hospital Length of Stay** | | | | | | | | | |
| 1 | observational study | **serious a** | not serious | not serious | not serious | none | One cohort study (**Gupta et al., 2021**)162 of 1,343 MET activations found no difference in hospital length of stay among patients who had an ICU Registrar-led vs. NP-led RRT. **We are uncertain about the effect of having a physician-led RRT/MET on hospital length of stay.** | ⨁◯◯◯ Very Low | IMPORTANT |
| **ICU Length of Stay** | | | | | | | | | |
| 1 | observational study | **serious a** | not serious | not serious | not serious | none | One cohort study (**Gupta et al., 2021**)162 of 1,343 MET activations found no difference in ICU length of stay among patients who had an ICU Registrar-led vs. NP-led RRT/MET. **We are uncertain about the effect of having a physician-led RRT/MET on ICU length of stay.** | ⨁◯◯◯ Very Low | IMPORTANT |
| **Unplanned ICU admissions** | | | | | | | | | |
| 3 | observational studies | **serious a** | **serious b** | not serious | not serious | none | A before-after study (**Rubis et al., 2013**)163 that compared physician-led vs. ACNP-led RRTs reported no difference in rates of unplanned ICU admissions. A cohort study (**Scherr et al., 2012**)137 found no difference in unplanned ICU transfers between intensivist intensivist-led and NP-led RRT/MET calls. Conversely, a cohort study (**Gupta et al., 2021**)162 of 1343 RRT/MET activations found higher rates of ICU admission within 24h of the index RRT/MET call among patients who had an ICU Registrar-led (15%) vs. NP-led (7.7%) RRTs. **Overall, given the inconsistency and issues related to risk of bias, we are uncertain about the effect of having a physician-led RRT/MET on unplanned ICU admissions.** | ⨁◯◯◯ Very Low | IMPORTANT |
| **Changes in goals of care/ resuscitation status** | | | | | | | | | |
| 1 | observational study | **serious a** | not serious | not serious | not serious | none | One cohort study (**Gupta et al., 2021**)162 of 1343 RRT/MET activations found no difference in changes in resuscitation status among patients who had an ICU Registrar-led (13.6%) vs. NP-led RRT/MET (16.2%). **We are uncertain about the effect of having a physician-led RRT/MET on changes in GOC.** | ⨁◯◯◯ Very Low | IMPORTANT |
|  | | | | | | | | | |

**RRT:** Rapid response team; **MET:** Medical emergency team; **ICU:** Intensive care unit; **NP:** Nurse Practitioner; **GOC:** Goals of care

#### Explanations

a. Rated down for risk of bias due to lack of adjustment for time of RRT calls as after-hour RRT calls more frequently led by the MD group (Gupta et al., 2021)162 and no adjustment for potential baseline differences between patients managed by MD led vs. non-MD led RRTs (Scherr et al., 2012137 and Rubis et al., 2013163).

b. Rated down for inconsistency due to variability in conclusions across studies.

**Summary of Judgements: Rapid response team composition**

|  | **JUDGMENT** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | Moderate | Large |  | Varies | **Don't know** |
| **UNDESIRABLE EFFECTS** | Large | Moderate | Small | Trivial |  | **Varies** | Don't know |
| **CERTAINTY OF EVIDENCE** | **Very low** | Low | Moderate | High |  |  | No included studies |
| **VALUES** | Important uncertainty or variability | Possibly important uncertainty or variability | Probably no important uncertainty or variability | **No important uncertainty or variability** |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **Don't know** |
| **RESOURCES REQUIRED** | Large costs | **Moderate costs** | Negligible costs and savings | Moderate savings | Large savings | Varies | Don't know |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **No included studies** |
| **EQUITY** | Reduced | **Probably reduced** | Probably no impact | Probably increased | Increased | Varies | Don't know |
| **ACCEPTABILITY** | No | Probably no | Probably yes | Yes |  | **Varies** | Don't know |
| **FEASIBILITY** | No | Probably no | Probably yes | Yes |  | **Varies** | Don't know |

**Type of Recommendation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | **Conditional recommendation for either the intervention or the comparison** | Conditional recommendation for the intervention | Strong recommendation for the intervention |
| ○ | ○ | **✓** | ○ | ○ |

**Supplemental Digital Content 10F**

## Question: Should we include palliative care trained personnel and/or focused education/guidance regarding goals of care discussions for non-ICU clinicians?

1. No studies evaluated the effect of including palliative care experts on the rapid response team (RRT) on patient outcomes.

2. Three studies evaluated various approaches to education/ guidance regarding goals of care discussions for patient’s clinical teams on patient outcomes:

* **Picker et al. (2016)164** randomized hospitalized patients in a 1:1 ratio to an intervention consisting of an RRT physician conveying scripted advice to the ward physician team that included the following components: (1) suggested palliative care discussions were appropriate given the patient’s early warning score (EWS) alert status, (2) advised them to determine the patient had a durable power of attorney or designated surrogate for medical decisions, and/ or an advanced directive for medical care, (3) advised them to discuss the patient’s preference for higher level of medical care in the event of deterioration, including mechanical ventilation with the patient or family, (4) obtain formal palliative care consultation if appropriate, and (5) document patient preferences for care of resuscitation status in the medical record.
* **Johnson et al. (2017)165** performed a before-after study evaluating outcomes after the implementation a two-pronged education intervention that included two components: (1) standard education involving three ward-based journal club sessions and discussions around cardiopulmonary resuscitation, and (2) a combined, two-pronged strategy involving the implementation of a 'Goals of Patient Care' (GoPC) form and a structured video-based workshop for ward medical staff.
* **Tam et al. (2014)166** performed a before-after study to evaluate two interventions: (1) a hospital-wide implementation of a Physician-Ordered Spectrum of Treatment (POST) preprinted order set to facilitate end-of-life discussions between ward clinicians and hospitalized patients and (2) outcomes among patients whose resuscitation status was discussed by rapid response team members with end-of-life training.

**Evidence Profile**

| **Certainty assessment** | | | | | | | **Impact** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** |
| **Re-evaluation and documentation of goals of care** | | | | | | | | | |
| 3 | 1 randomized trial  2 observational studies | not serious | not serious | not serious | not serious | **strong association** | 1. Picker et al. (2016)164 found that patients assigned to the intervention group had increased first-time advanced directive (control: 0/117; intervention: 13/89 or 14.6%; RR: 35.4, 95% CI 2.1 to 587.6), increased documentation of advanced directives (control: 18/117 or 15.4%; intervention: 33/89 or 37.1%; RR: 2.4, 95% CI, 1.5 to 4.0), and increased resuscitation status documentation (control: 27/117 or 23%; intervention: 32/89 or 36%; RR: 1.6, 95% CI, 1.0 to 2.4). 2. Johnson et al. (2017)165 found increased documentation of resuscitation status, including more documentation of its rationale, after the implementation of ward-based education and GOC order set after adjusting for patient characteristics (before: 45%; after: 90%). 3. Tam et al. (2014)166 found increased documentation of resuscitation status after implementation of a preprinted resuscitation status order set (before: 1.4%; after: 25%).   **Overall, this intervention may be associated with increased rates of re-evaluation and documentation of GOC** | ⨁⨁⨁◯ Moderate | IMPORTANT |
| **Change in resuscitation status** | | | | | | | | | |
| 3 | 1 randomized trial  2 observational study | not serious | not serious | not serious | not serious | **strong association** | 1. Picker et al. (2016)164 found no difference in the rates of changes in resuscitation status to DNAR between the control (11/117, 9.4%) and intervention groups (10/89, 11.2%) compared to RR: 1.2, 95% CI, 0.5 to 2.7). 2. Johnson et al. (2017)165 reported an increase in the number of patients with DNR code status after the implementation of ward-based education and GOC order set (before: 44%; after: 77%). 3. Tam et al. (2014)166 reported increased rates of change in resuscitation status to DNR after RRT consultation after the implementation of a preprinted resuscitation status order set (before: 20%; after: 31%).   **Overall, this intervention may be associated with increased rates of change in resuscitation status among hospitalized patients.** | ⨁⨁⨁◯ Moderate | IMPORTANT |
| **Palliative care consultation** | | | | | | | | | |
| 2 | 1 randomized trial  1 observational study | not serious | not serious | not serious | not serious | none | 1. One RCT (Picker et al., 2017)164 found no differences in the rates of referral for palliative care consultation between the control (7/117 or 6.0%) and intervention groups (7/89 or 7.9%; RR 1.3, 95% CI 0.5 to 3.6). 2. Tam et al. (2014)166 reported no change in the rate of palliative consultation after implementation of a preprinted EOL order set (14 vs. 12%). They reported a higher rate of palliative consultation among those whose resuscitation status changed to DNR after an EOL discussion by trained RRT personnel compared to those without a change in code status (from 5 to 34%).   **Overall, palliative care education/guidance on addressing GOC does not influence the rate of palliative care consultations among clinically deteriorating patients.** | ⨁⨁◯◯ Low | IMPORTANT |
| **Functional status at discharge** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | not serious | none | Johnson et al., 2017165 reported no change in patients’ Functional Independence Measure (FIM) scores, at the time of hospital discharge. | ⨁⨁◯◯ Low | IMPORTANT |
| **Discharge to residential care setting** | | | | | | | | | |
| 1 | observational study | not serious | not serious | not serious | **serious b** | none | Johnson et al. (2017) reported lower rates of discharge to residential care after implementation of a preprinted EOL order set (before: 15%, after: 8%). However, this finding is limited by a wide imprecision and the effect of palliative care education on discharge to residential setting is unclear. | ⨁◯◯◯ Very Low | IMPORTANT |
| **Length of stay** | | | | | | | | | |
| 3 | 1 randomized trial  2 observational studies | not serious | **serious a** | not serious | not serious | none | 1. Picker et al. (2017)164 found lower length of ICU in the intervention group, although the median length of ICU stay in both groups was 0 days. 2. Johnson et al. (2017)165 reported no change in hospital length of stay (before: 16.3 +/- 12.2; after: 16.9 +/- 10.8). 3. Tam et al. (2014)166 reported no change in length of ICU stay after implementation of a preprinted resuscitation status order set (before: 12 +/- 16, after: 14 +/- 44).   **Overall, the effect of palliative care education/ guidance on addressing GOC on length of ICU stay is unclear.** | ⨁◯◯◯ Very Low | IMPORTANT |

**RR:** risk ratio; **GOC:** Goals of care; **EOL:** end-of-life; **DNAR:** Do not attempt resuscitation

#### Explanations

a. Rated down for inconsistency due to variability in conclusions across studies.

b. Rated down for imprecision due to relatively small event rates and therefore, wide confidence intervals.

**Summary Of Judgements: Focused education/guidance regarding goals of care discussions for clinicians**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **JUDGMENT** | | | | | | |
| **PROBLEM** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **DESIRABLE EFFECTS** | Trivial | Small | Moderate | **Large** |  | Varies | Don't know |
| **UNDESIRABLE EFFECTS** | Large | Moderate | **Small** | Trivial |  | Varies | Don't know |
| **CERTAINTY OF EVIDENCE** | Very low | **Low** | Moderate | High |  |  | No included studies |
| **VALUES** | Important uncertainty or variability | Possibly important uncertainty or variability | **Probably no important uncertainty or variability** | No important uncertainty or variability |  |  |  |
| **BALANCE OF EFFECTS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | **Favors the intervention** | Varies | Don't know |
| **RESOURCES REQUIRED** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | Varies | **Don't know** |
| **CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **COST EFFECTIVENESS** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **No included studies** |
| **EQUITY** | Reduced | Probably reduced | Probably no impact | **Probably increased** | Increased | Varies | Don't know |
| **ACCEPTABILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **FEASIBILITY** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |

**Type of Recommendation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | **Conditional recommendation for the intervention** | Strong recommendation for the intervention |
| ○ | ○ | ○ | **✓** | ○ |