**Supplemental Appendix 1**

**Methods.**

Data abstraction form included:

1. Article information (title, first author, year of publication);
2. Study characteristics and study patient population (study design, hospital setting (floor, intensive care unit (ICU), emergency department), total number of study participants, total number of study participants meeting the criteria for deterioration, study patients' characteristics, patient outcomes assessed in the study, type and description of HIT, type of clinical deterioration detected, number of patients in the intervention and comparison groups (all patients receiving intervention or usual care and number of patients meeting deterioration criteria in intervention and control groups);
3. Hospital, ICU and other time points mortality (N, %) in intervention and comparison groups, difference in mortality (adjusted and/or non-adjusted odds ratio, including 95% CI and p-value);
4. Mean (SD) or Median (IQR) hospital length of stay (LOS) in intervention and comparison groups, mean difference in hospital LOS (adjusted and/or non-adjusted, including 95% CI and p-value);
5. Mean (SD) or Median (IQR) ICU LOS in intervention and comparison groups, mean difference in ICU LOS (adjusted and/or non-adjusted, including 95% CI and p-value);
6. Study conclusions and reviewers’ comments.

**Results.**

Hospital Mortality

Cumulative analysis was performed for RCTs and revealed a positive temporal trend with the use of HIT associated with lower rates of hospital mortality in the studies published in 2015 compared to studies published in 2012 and 2013 (Supplemental Fig. 5, http://links.lww.com/CCM/H102). However, no difference in hospital mortality between the intervention and the control groups was demonstrated in all four studies, and the small number of the studies means we cannot make any robust conclusion.

Eight pre-post studies provided information on hospital mortality but did not include data that could be quantitatively synthesized via meta-analysis. Of these studies, five reported no significant difference in hospital mortality (1-5), two (6, 7) demonstrated a statistically significant decrease in sepsis-related hospital mortality, and one (8) evaluated the combined intervention including off-site nursing review and reported a significant improvement in hospital mortality in the intervention group.

ICU and Other Time Points Mortality

*ICU Mortality:*

Five pre-post studies evaluated ICU mortality. Two of them (9, 10) reported a statistically significant decrease in ICU mortality in the intervention group (OR 0.38 [0.22, 0.66] and 0.26 [0.07, 0.92]). Huff et al. (11) assessed ICU mortality for all patients who were transferred to the ICU within 24 hours of admission and found a significant decrease in ICU mortality (by 23%, p<0.05) in the intervention group. Two studies did not demonstrate a significant change in ICU mortality with the use of HIT (OR 1.2 [0.81, 1.77] and 0.87 [0.54, 1.40]) (1, 12).

*Other Mortality:*

Seven-day mortality was evaluated in one study (13), and 14-day mortality was evaluated in two studies (13, 14). Six studies (1, 12, 13, 15-17) assessed mortality at 28 or 30 days. No statistically significant improvements were demonstrated in any of these.

One study evaluating a combined intervention including off-site nursing review (8), demonstrated a statistically significant decrease in mortality (adjusted relative risk of death within 30 days after alert 0.84 [95% CI 0.78–0.90]).

Eight studies reported mortality at several time points: ICU and hospital mortality (9, 10); ICU, hospital and 28- or 30-day mortality (1, 12); hospital and 28- or 30-day mortality (8, 15, 16); or hospital, 7-, 14-, and 30-day mortality (13). Interestingly, studies reporting mortality at different time points demonstrated the same direction of the effect of the intervention on the proximate and late mortality time points.

Hospital LOS

Of the six pre-post studies not included in the meta-analysis, four (5-7, 11) did not demonstrate any reduction in hospital LOS, one study (18) reported a statistically significant increase in hospital LOS in one of two study units and a non-significant increase in another, and one more (8) demonstrated significant reduction in hospital LOS among patients receiving combined intervention.

ICU Length of Stay

Among the included studies, 9/30 (1, 9, 12, 15, 16, 19-22) assessed ICU LOS as an outcome. Of these, 6 (1, 9, 16, 19, 20, 22) reported the ICU LOS for the entire study cohort, 2 studies (15, 21) reported the ICU LOS only for those patients who met the criteria of deterioration, and 1 (12) reported both.

*Meta-Analysis Entire Cohort:*

Among the studies assessing the entire study cohort, two RCTs did not demonstrate any change in the ICU LOS (mean difference 0.00 [-0.70, 0.70] and 0.00 [-0.28, 0.28]) (20, 22). In the meta-analysis of 5 pre-post studies, HIT implementation was also not associated with a significant decrease in ICU LOS. (mean difference -0.34 [95% CI -0.78, 0.09]) (Supplemental Fig. 4, http://links.lww.com/CCM/H101).

The heterogeneity in this set of the studies was substantial and could be partially explained by the difference in types of deterioration detected by HIT (subgroup analyses, Supplemental Fig. 5, http://links.lww.com/CCM/H102).

Among the studies that reported the ICU LOS for those patients who met the criteria for deterioration (12, 15, 21), none demonstrated significant differences in ICU LOS (mean difference 0.99 [0.76–1.28], 0.58 [0.06, 1.11], and -1.00 [-2.06, 0.06]).

**References:**

1. Colpaert K, Hoste EA, Steurbaut K, et al. Impact of real-time electronic alerting of acute kidney injury on therapeutic intervention and progression of RIFLE class. Crit Care Med 2012;40(4):1164-1170.

2. Fogerty RL, Sussman LS, Kenyon K, et al. Using System Inflammatory Response Syndrome as an Easy-to-Implement, Sustainable, and Automated Tool for All-Cause Deterioration Among Medical Inpatients. J Patient Saf 2019;15(4):e74-e77.

3. Heller AR, Mees ST, Lauterwald B, et al. Detection of Deteriorating Patients on Surgical Wards Outside the ICU by an Automated MEWS-Based Early Warning System With Paging Functionality. Ann Surg 2020;271(1):100-105.

4. Horton DJ, Graves KK, Kukhareva PV, et al. Modified early warning score-based clinical decision support: cost impact and clinical outcomes in sepsis. JAMIA Open 2020;3(2):261-268.

5. Weller RS, Foard KL, Harwood TN. Evaluation of a wireless, portable, wearable multi-parameter vital signs monitor in hospitalized neurological and neurosurgical patients. J Clin Monit Comput 2018;32(5):945-951.

6. Manaktala S, Claypool SR. Evaluating the impact of a computerized surveillance algorithm and decision support system on sepsis mortality. J Am Med Inform Assoc 2017;24(1):88-95.

7. McCoy A, Das R. Reducing patient mortality, length of stay and readmissions through machine learning-based sepsis prediction in the emergency department, intensive care unit and hospital floor units. BMJ Open Qual 2017;6(2):e000158.

8. Escobar GJ, Liu VX, Schuler A, et al. Automated Identification of Adults at Risk for In-Hospital Clinical Deterioration. N Engl J Med 2020;383(20):1951-1960.

9. Olchanski N, Dziadzko MA, Tiong IC, et al. Can a Novel ICU Data Display Positively Affect Patient Outcomes and Save Lives? J Med Syst 2017;41(11):171.

10. Subbe CP, Duller B, Bellomo R. Effect of an automated notification system for deteriorating ward patients on clinical outcomes. Crit Care 2017;21(1):52.

11. Huff S, Stephens K, Whiteman K, et al. Implementation of a Vital Sign Alert System to Improve Outcomes. J Nurs Care Qual 2019;34(4):346-351.

12. Umscheid CA, Betesh J, VanZandbergen C, et al. Development, implementation, and impact of an automated early warning and response system for sepsis. J Hosp Med 2015;10(1):26-31.

13. Wilson FP, Shashaty M, Testani J, et al. Automated, electronic alerts for acute kidney injury: a single-blind, parallel-group, randomised controlled trial. Lancet 2015;385(9981):1966-1974.

14. Wilson FP, Martin M, Yamamoto Y, et al. Electronic health record alerts for acute kidney injury: multicenter, randomized clinical trial. Bmj 2021;372:m4786.

15. Giannini HM, Ginestra JC, Chivers C, et al. A Machine Learning Algorithm to Predict Severe Sepsis and Septic Shock: Development, Implementation, and Impact on Clinical Practice. Crit Care Med 2019;47(11):1485-1492.

16. Mestrom E, De Bie A, Steeg MV, et al. Implementation of an automated early warning scoring system in a surgical ward: Practical use and effects on patient outcomes. PLoS One 2019;14(5):e0213402.

17. Park S, Baek SH, Ahn S, et al. Impact of Electronic Acute Kidney Injury (AKI) Alerts With Automated Nephrologist Consultation on Detection and Severity of AKI: A Quality Improvement Study. Am J Kidney Dis 2018;71(1):9-19.

18. Evans RS. Electronic Health Records: Then, Now, and in the Future. Yearb Med Inform 2016;Suppl 1(Suppl 1):S48-61.

19. Bourdeaux C, Ghosh E, Atallah L, et al. Impact of a computerized decision support tool deployed in two intensive care units on acute kidney injury progression and guideline compliance: a prospective observational study. Crit Care 2020;24(1):656.

20. Hooper MH, Weavind L, Wheeler AP, et al. Randomized trial of automated, electronic monitoring to facilitate early detection of sepsis in the intensive care unit\*. Crit Care Med 2012;40(7):2096-2101.

21. Kollef MH, Chen Y, Heard K, et al. A randomized trial of real-time automated clinical deterioration alerts sent to a rapid response team. J Hosp Med 2014;9(7):424-429.

22. Pickering BW, Dong Y, Ahmed A, et al. The implementation of clinician designed, human-centered electronic medical record viewer in the intensive care unit: a pilot step-wedge cluster randomized trial. Int J Med Inform 2015;84(5):299-307.

**Supplemental Table 1.** PRISMA Checklist

**Supplemental Table 2.** Actual Search Strategy

**Supplemental Table 3.** Eligible Studies and Participant Characteristics

**Supplemental Table 4.** Interventions and Outcomes for the Eligible Studies

**Supplemental Table 5.** Risk of Bias in Randomized Controlled Studies

**Supplemental Table 6.** Risk of Bias in Non-Randomized Studies

**Supplemental Table 7.** Quality of Evidence

**Supplemental Figure 1** – Hospital Mortality in the entire cohort of patients who received the intervention (Health Information Technology for early detection of deterioration) compared to usual care. Subgroup analysis of the pre-post studies. **A**, Subgroup analysis by risk of bias. **B**, Subgroup analysis by study setting. **C**, Subgroup analysis by the type of clinical deterioration. The size of the data markers represents the weight each study has in the pooled result.

*Abbreviations: ICU = intensive care unit; ED = emergency department; AKI = acute kidney injury*

**Supplemental Figure 2** – Hospital length of stay in the entire cohort of patients who received the intervention (Health Information Technology for early detection of deterioration) compared to usual care. Subgroup analysis of the pre-post studies. **A**, Subgroup analysis by risk of bias. **B**, Subgroup analysis by study setting. **C**, Subgroup analysis by the type of clinical deterioration. The size of the data markers represents the weight each study has in the pooled result.

**Supplemental Figure 3.** ICU length of stay in the entire cohort of patients who received the intervention (Health Information Technology for early detection of deterioration) compared to usual care. Meta-analysis of the pre-post studies. The size of the data markers represents the weight each study has in the pooled result.

**Supplemental Figure 4.** ICU length of stay in the entire cohort of patients who received the intervention (Health Information Technology for early detection of deterioration) compared to usual care. Subgroup analysis of the pre-post studies. **A**, Subgroup analysis by risk of bias. **B**, Subgroup analysis by hospital setting. **C**, Subgroup analysis by the type of clinical deterioration. The size of the data markers represents the weight each study has in the pooled result.

*Abbreviations: ICU = intensive care unit; AKI = acute kidney injury*

**Supplemental Figure 5.** Hospital Mortality in the entire cohort of patients who received the intervention (Health Information Technology for early detection of deterioration) compared to usual care. Cumulative analysis of randomized controlled trials by the year of publication. The size of the data markers represents the weight each study has in the pooled result.