Early Hospital Discharge Following PCI for Patients With STEMI

Rathod KS, Comer K, Casey-Gillman O, et al. Early hospital discharge following PCI for patients with STEMI. J Am Coll Cardiol. 2021;78:2550-2560. doi:10.1016/j.jacc.2021.09.1379

Study Overview

Objective: To assess the safety and efficacy of early hospital discharge (EHD) for selected low-risk patients with ST-segment elevation myocardial infarction (STEMI) after primary percutaneous coronary intervention (PCI).

Design: Single-center retrospective analysis of prospectively collected data.

Setting and participants: An EHD group comprised of 600 patients who were discharged at <48 hours between April 2020 and June 2021 was compared to a control group of 700 patients who met EHD criteria but were discharged at >48 hour between October 2018 and June 2021. Patients were selected into the EHD group based on the following criteria, in accordance with recommendations from the European Society of Cardiology, and all patients had close follow-up with a combination of structured telephone follow-up at 48 hours post discharge and virtual visits at 2, 6, and 8 weeks and at 3 months:

- Left ventricular ejection fraction ≥40%
- Successful primary PCI (that achieved thrombolysis in myocardial infarction flow grade 3)
- Absence of severe nonculprit disease requiring further inpatient revascularization
- Absence of ischemic symptoms post PCI
- Absence of heart failure or hemodynamic instability
- Absence of significant arrhythmia (ventricular fibrillation, ventricular tachycardia, or atrial fibrillation or atrial flutter requiring prolonged stay)
- Mobility with suitable social circumstances for discharge

Main outcome measures: The outcomes measured were length of hospitalization and a composite primary endpoint of cardiovascular mortality and major adverse cardiovascular event (MACE) rates, defined as a composite of all-cause mortality, recurrent MI, and target lesion revascularization.

Main results: The median length of stay of hospitalization in the EHD group was 24.6 hours compared to 56.1 hours in the >48-hour historical control group. On median follow-up of 271 days, the EHD group demonstrated 0% cardiovascular mortality and a MACE rate of 1.2%. This was shown to be noninferior compared to the >48-hour historical control group, which had mortality of 0.7% and a MACE rate of 1.9%.

Conclusion: Selected low-risk STEMI patients can be safely discharged early with appropriate follow-up after primary PCI.

Commentary

Patients with STEMI have a higher risk of postprocedural adverse events such as MI, arrhythmia, or acute heart failure compared to patients with stable ischemic heart disease, and thus are monitored after primary PCI. Although patients were traditionally monitored for 5 to 7 days a few decades ago,[1] with improvements in PCI techniques, devices, and pharmacotherapy as well as in door-to-balloon time, the in-hospital complication rates for patients with STEMI have been decreasing, leading to earlier discharge. Currently in the United States, patients are most commonly monitored for 48 to 72 hours post PCI.[2] The current guidelines support this practice, recommending early discharge within 48 to 72 hours in selected low-risk patients if adequate follow-up and rehabilitation are arranged.[3]

Given the COVID-19 pandemic and decreased hospital bed availability, Rathod et al took one step further on the question of whether low-risk STEMI patients with primary PCI can be discharged safely within 48 hours with adequate follow-up. They found that at a median follow-up of 271 days, EHD patients had 2 COVID-related deaths, with 0% cardiovascular mortality and a MACE rate of 1.2%, including deaths, MI, and ischemic revascularization. The median time to discharge was 25 hours. This was noninferior to the >48-hour historical control group, which had mortality of 0.7% ($P=0.349$) and a MACE rate of 1.9% ($P=.674$). The results remained similar after propensity matching for mortality (0.34% vs 0.69%, $P=.410$) or MACE (1.2% vs 1.9%, $P=.342$).

This is the first prospective study to systematically assess the safety and feasibility of discharge of low-risk STEMI patients with primary PCI within 48 hours. This study is unique in that it involved the use of telemedicine, including a virtual platform to collect data such as heart rate, blood pressure, and blood glucose, and virtual visits to facilitate follow-up and reduce clinic travel, cost, and potential COVID-19 exposure. The investigators' protocol included virtual follow-up by cardiology advanced practitioners at 2, 6, and 8 weeks and by an interventional cardiologist at 12 weeks. This protocol led to an increase in patient satisfaction. The study's main limitation is that it is a single-center trial with a smaller sample size. Further studies are necessary to confirm the safety and feasibility of this approach. In addition, further refinement of the patient selection criteria for EHD should be considered.

Application for Clinical Practice

In low-risk STEMI patients after primary PCI, discharge within 48 hours may be considered if close follow-up is arranged. However, further studies are necessary to confirm this finding.

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Using a Real-Time Prediction Algorithm to Improve Sleep in the Hospital

Najafi N, Robinson A, Pletcher MJ, Patel S. Effectiveness of an analytics-based intervention for reducing sleep interruption in hospitalized patients: a randomized clinical trial. JAMA Intern Med. 2022:182(2):172-177. doi:10.1001/jamainternmed.2021.7387

Study Overview

Objective: This study evaluated whether a clinical-decision-support (CDS) tool that utilizes a real-time algorithm incorporating patient vital sign data can identify hospitalized patients who can forgo overnight vital sign checks and thus reduce delirium incidence.

Design: This was a parallel randomized clinical trial of adult inpatients admitted to the general medical service of a tertiary care academic medical center in the United States. The trial intervention consisted of a CDS notification in the electronic health record (EHR) that informed the physician if a patient had a high likelihood of nighttime vital signs within the reference ranges based on a logistic regression model of real-time patient data input. This notification provided the physician an opportunity to discontinue nighttime vital sign checks, dismiss the notification for 1 hour, or dismiss the notification until the next day.

Setting and participants: This clinical trial was conducted at the University of California, San Francisco Medical Center from March 11 to November 24, 2019. Participants included physicians who served on the primary team (eg, attending, resident) of 1699 patients on the general medical service who were outside of the intensive care unit (ICU). The hospital encounters were randomized (allocation ratio of 1:1) to the sleep promotion vitals CDS (SPV CDS) intervention or usual care.

Main outcome and measures: The primary outcome was delirium as determined by bedside nurse assessment using the Nursing Delirium Screening Scale (Nu-DESC) recorded once per nursing shift. The Nu-DESC is a standardized delirium screening tool that defines delirium with a score ≥2. Secondary outcomes included sleep opportunity (ie, EHR-based sleep metrics that reflected the maximum time between iatrogenic interruptions, such as nighttime vital sign checks) and patient satisfaction (ie, patient satisfaction measured by standardized Hospital Consumer Assessment of Healthcare Providers and Systems [HCAHPS] survey). Potential balancing outcomes were assessed to ensure that reduced vital sign checks were not causing harms; these included ICU transfers, rapid response calls, and code blue alarms. All analyses were conducted on the basis of intention-to-treat.

Main results: A total of 3025 inpatient encounters were screened and 1930 encounters were randomized (966 SPV CDS intervention; 964 usual care). The randomized encounters consisted of 1699 patients; demographic factors between the 2 trial arms were similar. Specifically, the intervention arm included 566 men (59%) and mean (SD) age was 53 (15) years. The incidence of delirium was similar between the intervention and usual care arms: 108 (11%) vs 123 (13%) ($P = .32$). Compared to the usual care arm, the intervention arm had a higher mean (SD) number of sleep opportunity hours per night (4.95 [1.45] vs 4.57 [1.30], $P < .001$) and fewer nighttime vital sign checks (0.97 [0.95] vs 1.41 [0.86], $P < .001$). The postdischarge HCAHPS survey measuring patient satisfaction was completed by only 5% of patients (53 intervention, 49 usual care), and survey results were similar between the 2 arms ($P = .86$). In addition, safety outcomes including ICU transfers (49 [5%] vs 47 [5%], $P = .92$), rapid response calls (68 [7%] vs 55 [6%], $P = .27$), and code blue alarms (2 [0.2%] vs 9 [0.9%], $P = .07$) were similar between the study arms.

Conclusion: In this randomized clinical trial, a CDS tool utilizing a real-time prediction algorithm embedded in EHR did not reduce the incidence of delirium in hospitalized

patients. However, this SPV CDS intervention helped physicians identify clinically stable patients who can forgo routine nighttime vital sign checks and facilitated greater opportunity for patients to sleep. These findings suggest that augmenting physician judgment using a real-time prediction algorithm can help to improve sleep opportunity without an accompanying increased risk of clinical decompensation during acute care.

Commentary

High-quality sleep is fundamental to health and well-being. Sleep deprivation and disorders are associated with many adverse health outcomes, including increased risks for obesity, diabetes, hypertension, myocardial infarction, and depression.[1] In hospitalized patients who are acutely ill, restorative sleep is critical to facilitating recovery. However, poor sleep is exceedingly common in hospitalized patients and is associated with deleterious outcomes, such as high blood pressure, hyperglycemia, and delirium.[2,3] Moreover, some of these adverse sleep-induced cardiometabolic outcomes, as well as sleep disruption itself, may persist after hospital discharge.[4] Factors that precipitate interrupted sleep during hospitalization include iatrogenic causes such as frequent vital sign checks, nighttime procedures or early morning blood draws, and environmental factors such as loud ambient noise.[3] Thus, a potential intervention to improve sleep quality in the hospital is to reduce nighttime interruptions such as frequent vital sign checks.

In the current study, Najafi and colleagues conducted a randomized trial to evaluate whether a CDS tool embedded in EHR, powered by a real-time prediction algorithm of patient data, can be utilized to identify patients in whom vital sign checks can be safely discontinued at nighttime. The authors found a modest but statistically significant reduction in the number of nighttime vital sign checks in patients who underwent the SPV CDS intervention, and a corresponding higher sleep opportunity per night in those who received the intervention. Importantly, this reduction in nighttime vital sign checks did not cause a higher risk of clinical decompensation as measured by ICU transfers, rapid response calls, or code blue alarms. Thus, the results demonstrated the feasibility of using a real-time, patient data–driven CDS tool to augment physician judgment in managing sleep disruption, an important hospital-associated stressor and a common hazard of hospitalization in older patients.

Delirium is a common clinical problem in hospitalized older patients that is associated with prolonged hospitalization, functional and cognitive decline, institutionalization, death, and increased health care costs.[5] Despite a potential benefit of the SPV CDS intervention in reducing vital sign checks and increasing sleep opportunity, this intervention did not reduce the incidence of delirium in hospitalized patients. This finding is not surprising given that delirium has a multifactorial etiology (eg, metabolic derangements, infections, medication side effects and drug toxicity, hospital environment). A small modification in nighttime vital sign checks and sleep opportunity may have limited impact on optimizing sleep quality and does not address other risk factors for delirium. As such, a multicomponent nonpharmacologic approach that includes sleep enhancement, early mobilization, feeding assistance, fluid repletion, infection prevention, and other interventions should guide delirium prevention in the hospital setting. The SPV CDS intervention may play a role in the delivery of a multifaceted, nonpharmacologic delirium prevention intervention in high-risk individuals.

Sleep disruption is one of the multiple hazards of hospitalization older patients frequently experience. Other hazards, or hospital-associated stressors, include mobility restriction (eg, physical restraints such as urinary catheters and intravenous lines, bed elevation and rails), malnourishment and dehydration (eg, frequent use of no-food-by-mouth order, lack of easy access to hydration), and pain (eg, poor pain control). Extended exposures to these stressors may lead to a maladaptive state called *allostatic overload* that transiently increases vulnerability to post-hospitalization adverse events, including emergency department use, hospital readmission, or death (ie, post-hospital syndrome).[6] Thus, the optimization of sleep during hospitalization in vulnerable patients may have benefits that extend beyond delirium prevention. It is perceivable that a CDS tool embedded in EHR, powered by a real-time prediction algorithm of patient data, may be applied to reduce some of these hazards of hospitalization in addition to improving sleep opportunity.

Application for Clinical Practice

Findings from the current study indicate that a CDS tool embedded in EHR that utilizes a real-time prediction algorithm of patient data may help to safely improve sleep opportunity in hospitalized patients. The participants in the current study were relatively young (53 [15] years). Given that age is a risk factor for delirium, the effects of this intervention on delirium prevention in the most susceptible population (ie, those over the age of 65) remain unknown and further investigation is warranted. Additional studies are needed to determine whether this approach yields similar results in geriatric patients and improves clinical outcomes.

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