Application of the EPIC Deterioration Index to Predict Postoperative Complications Among Orthopedic Polytrauma Patients

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INTRODUCTION: The EPIC Deterioration Index (EDI) is a proprietary clinical prediction model embedded within EPIC's electronic health record that employs routinely collected physiologic and laboratory data in order to estimate a patient's risk of clinical deterioration. The efficacy of this metric has been demonstrated in medical and critical care populations, however, its utility has not yet been defined in surgical cohorts, specifically among orthopedic trauma patients. As postoperative complications in this population often contribute to prolonged hospitalizations, higher readmission rates, and increased health care costs, the importance of accurate detection of clinical deterioration cannot be understated. Thus, our objective was to determine the efficacy of EDI values toward predicting postoperative complications in orthopedic trauma patients.

METHODS: This is a retrospective study of adult patients undergoing orthopedic procedures for traumatic upper extremity, lower extremity, and pelvic fractures at a single academic center between November 2023 and January 2025. EDI values were collected at admission and at predefined postoperative time points (3, 6, 12, 24, 36, 48, and 72 hrs) and subsequently assessed for correlation with 90-day postoperative complications using chi-square tests, independent t-tests, and multivariable firth logistic regression models.

RESULTS: 273 patients were included in our analysis, including 147 males and 126 females with a mean age at surgery of 56.6 years. EDI values did not differ significantly between sexes or racial/ethnic groups at any recorded time point. Elevated EDI values at the time of admission correlated significantly with an increased risk of cardiovascular complications. Similarly, increases in EDI values at 6-12 hours postoperatively corresponded to an increased risk of eventual readmission or reoperation. Infectious and pulmonary complications demonstrated statistical significance at 36-48 hours and 48-72 hours, respectively, and elevated EDI values at 48 hours postoperatively correlated with an increased risk for prolonged hospital admission. Finally, increases in EDI scores at 12, 48, and 72 hours signified a higher overall risk for adverse events during admission or following discharge.

DISCUSSION: EDI values collected throughout hospitalization demonstrated a number of significant correlations with postoperative outcomes and complications, with early elevations in EDI values corresponding to an increased likelihood of cardiovascular events or unplanned reoperations, while later elevations were more indicative of impending pulmonary or infectious complications. Taken together, these findings indicate that EDI may act as a valuable tool for identifying temporally-associated complications in orthopedic trauma patients and subsequently allow for tailored management strategies to alleviate risk in patients with signs of early clinical deterioration. Future studies should aim to delineate the predictive efficacy of these values relative to established metrics and further describe its applications to additional patient populations.

CLINICAL RELEVANCE: These findings suggest that the EDI may offer real-time postoperative risk stratification without additional data collection. Early identification of at-risk patients could enable targeted monitoring and improved allocation of clinical resources in orthopedic trauma care.

Table 1. Significant Associations between EDI Scores at Different Time Points versus Postoperative Outcomes				
Outcome/Complication	**EDI Time Point**	**Odds Ratio**	**95% Confidence Intervals**	***p* value**
Cardiovascular				
	Admission	1.06	1.01-1.12	0.03
Infectious				
	36hrs Postoperatively	1.05	1.01-1.10	0.05
	48hrs Postoperatively	1.06	1.01-1.13	0.02
Length of Stay > 7 Days				
	48hrs Postoperatively	1.05	1.01 - 1.09	0.03
Readmission/Reoperation				
	6hrs Postoperatively	1.05	1.01-1.10	0.04
	12hrs Postoperatively	1.05	1.01-1.11	0.02
	72hrs Postoperatively	1.08	1.01-1.16	0.01
Pulmonary Complications				
	48hrs Postoperatively	1.08	1.01-1.16	0.04
	72hrs Postoperatively	1.12	1.03-1.20	0.004
Any Adverse Event				
	12hrs Postoperatively	1.08	1.02-1.17	0.01
	48hrs Postoperatively	1.07	1.00-1.17	0.04
	72hrs Postoperatively	1.10	1.02-1.23	0.02