Predictive Modeling for a Geriatric Hip Fracture Program as a Method of Assessing Outcomes

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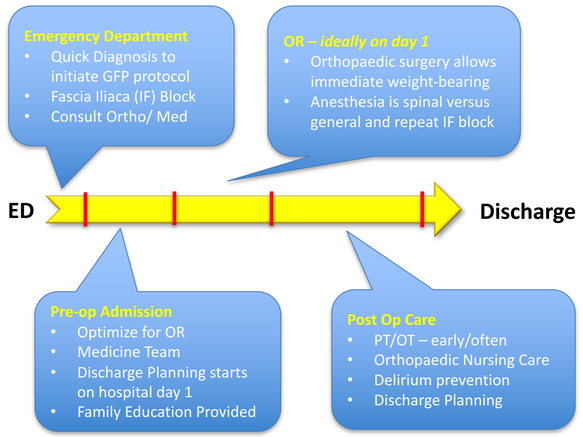
Aims

1) Compare post- and pre-GFP patient groups characteristics and outcomes.
2) Apply a predictive model developed from two years of Geriatric Fracture Program (GFP) patients to pre-GFP patients to account for patient complexity in analyzing the outcomes of the UC Davis GFP.

Background

- >300,000 geriatric hip fractures per year in the United States, incidence expected to increase[1,2]
- High rates of complications, leading to prolonged hospitalizations[3].
- $9-15bn/yr of inpatient costs[4].
- $26,000-$35,000 average hospitalization cost alone
- Programs of coordinated care have been developed with markedly improved outcomes[4].
- **In January 2014, UCDMC introduced the multi-disciplinary Geriatric Fracture Program (GFP).**



Methods

- Retrospective chart review of 2012-2013 (pre-GFP, n=119) and 2014-2015 (post-GFP n=174) with the following data abstracted:
  - Charlson Comorbidity Index (CCI)
  - Time to surgery (TtoS)
  - Delays to surgery (DTS)
  - Delirium
  - Other Complications
  - LOS
  - INR
  - ASA score
  - Ortho Ward
  - Demographics
- A predictive LOS (PLOS) model was created by a multivariate regression analysis with post-GFP data.
- The model was retroactively applied to the pre-GFP group to assess improvements.
- A threshold of PLOS + 1.5 days as a clinically-relevant cutoff for estimating if the GFP could have improved each patients actual LOS

Results

- Actual LOS and complications significantly declined after initiation of the GFP; delirium was detected much more commonly
- Using the PLOS model, 49.5% of patients in the pre-GFP group would have had decreased LOS under the GFP management (Figure 1).

Variable	Parameter estimate	P-value
Time to Surgery (Each midnight)	+ 0.14	0.0016 *
ASA Score (one point increase)	+ 0.12	0.0689
CCI < 4	- 0.02	0.8058
Age (each decade > 82)	+ 0.002	0.5590
Gender (Female)	- 0.04	0.5522
Cohorted on D14 (Ortho ward)	- 0.08	0.2319
Initial INR <1.5	- 0.18	0.0844
No delirium	- 0.19	0.0082 *

Table 1: Unadjusted Regression Analysis of LOS by Demographics and Clinical Characteristics. **statistical significance*

Results

	Pre-GFP 2012-2013 (N=119)	Post-GFP 2014-2015 (N=174)	P-value
Age	81.2 ± 8.4	82.0 ± 7.9	0.4585
Sex	83 F (69.8%)	118 F (67.8%)	0.7264
CCI < 4	89 (74.8%)	133 (76.4%)	0.7466
ASA Score	2: 17 (14.3%) 3: 71 (59.7%) 4: 31 (26.1%)	2: 18 (10.7%) 3: 117 (69.2%) 4: 34 (19.5%)	0.2862
Time to Surgery (Midnights)	0: 3 (2.5%) 1: 87 (73.1%) 2+: 29 (23.6%)	0: 8 (4.6%) 1: 113 (64.9%) 2: 53 (30.6%)	0.5331
INR (initial)	INR < 1.5: 109 (91.6%)	INR < 1.5: 149 (85.6%)	0.1221
Delirium	27 (22.7%)	74 (42.5%)	0.0004 *
Ortho Ward	66 (55.5%)	100 (57.5%)	0.7332
Complications (not delirium)	42 (35.3%)	31 (17.8%)	0.0007 *
Length of Stay	7.8 ± 6.0	5.9 ± 3.1	0.0023 *
Delay to surgery (>2 midnights)	26 (21.9%)	52 (29.9%)	0.1264

Table 2. Demographic and Clinical Characteristics of Geriatric Fracture Program Patients. **statistical significance*

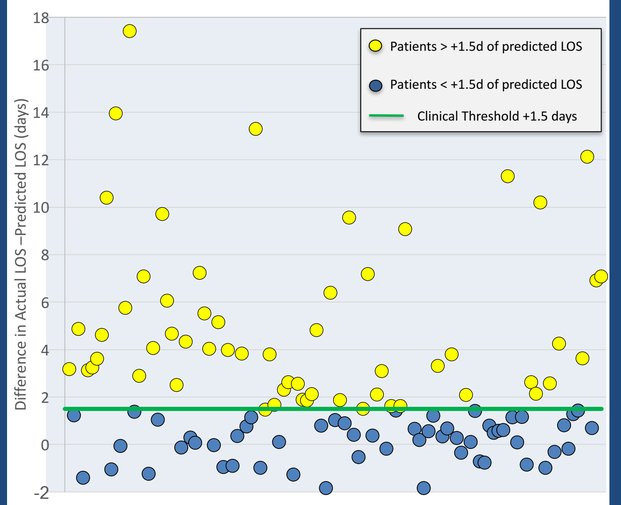


Figure 1: Predictive Length of Stay Model Applied to pre-GFP Patients with PLOS+1.5 Days set as Threshold for Clinical Relevance

Conclusions

- Length of stay is a useful proxy for both quality of care, complications, and cost effectiveness in our geriatric fracture program.
- This type of modeling is novel in this population and important for QI focus and hospital resource allocation.
- Clinically modifiable variables that significantly impacted LOS included delirium prevention and decreasing time to surgery.
- Our predictive model indicates that if the GFP was retroactively applied to the 2012-2013 patients nearly half would could have had a predicted LOS at least 1.5 days shorter.
- There were decreased complications, excluding delirium, and length of stay after the GFP was applied to similar patients.
- The apparent increase in delirium is likely an effect of the increased effort placed on nursing reporting of Confusion Assessment Method (CAM) scores mandated by the GFP.

Acknowledgements

References

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