

Pulmonary function testing is an unreliable tool for risk assessment of patients with adolescent idiopathic scoliosis undergoing posterior spinal fusion

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Introduction

- Avoiding unnecessary preoperative testing is a high-priority area for reducing the waste of medical resources.¹
- Adolescent idiopathic scoliosis (AIS) is the surgical condition with the greatest cumulative annual cost in pediatric inpatient care, making it a target for quality improvement.²
- Pulmonary function tests (PFTs) are often recommended for risk stratification of pediatric patients undergoing posterior spinal fusion (PSF).³
- This practice has been called into question due to frequently inconclusive results and unclear impact of PFTs on perioperative clinical management.⁴
- We hypothesize that a large percentage of patients undergoing PSF for AIS are unable to produce meaningful results on PFTs, and that among patients who are able to complete the test, results do not predict perioperative risk.

Methods

- Following IRB approval, we performed a retrospective observational chart review of all patients undergoing PSF for AIS from June 2012 through August 2017 at a single tertiary care pediatric center where preoperative PFTs are routinely ordered.
- Preoperative data collected included patient age, sex, weight, ASA physical status, Cobb angle, and PFT data when available, including FVC (forced vital capacity), FEV1 (forced expiratory volume in 1 second), FEV1/FVC ratio, MIP (maximum inspiratory force), and response to bronchodilators.
- Postoperative data collected included presence or absence of postoperative intubation and/or intensive care unit (ICU) admission and indication for ICU admission when applicable.
- Primary outcome was incidence of satisfactory completion of PFTs.
- Secondary outcomes were as follows:
 - Diagnosis of severe restrictive lung disease, as defined by FVC <40% of predicted value or MIP <30 cmH2O.
 - Postoperative complications requiring admission to the ICU
 - Respiratory failure requiring postoperative mechanical ventilation

Results

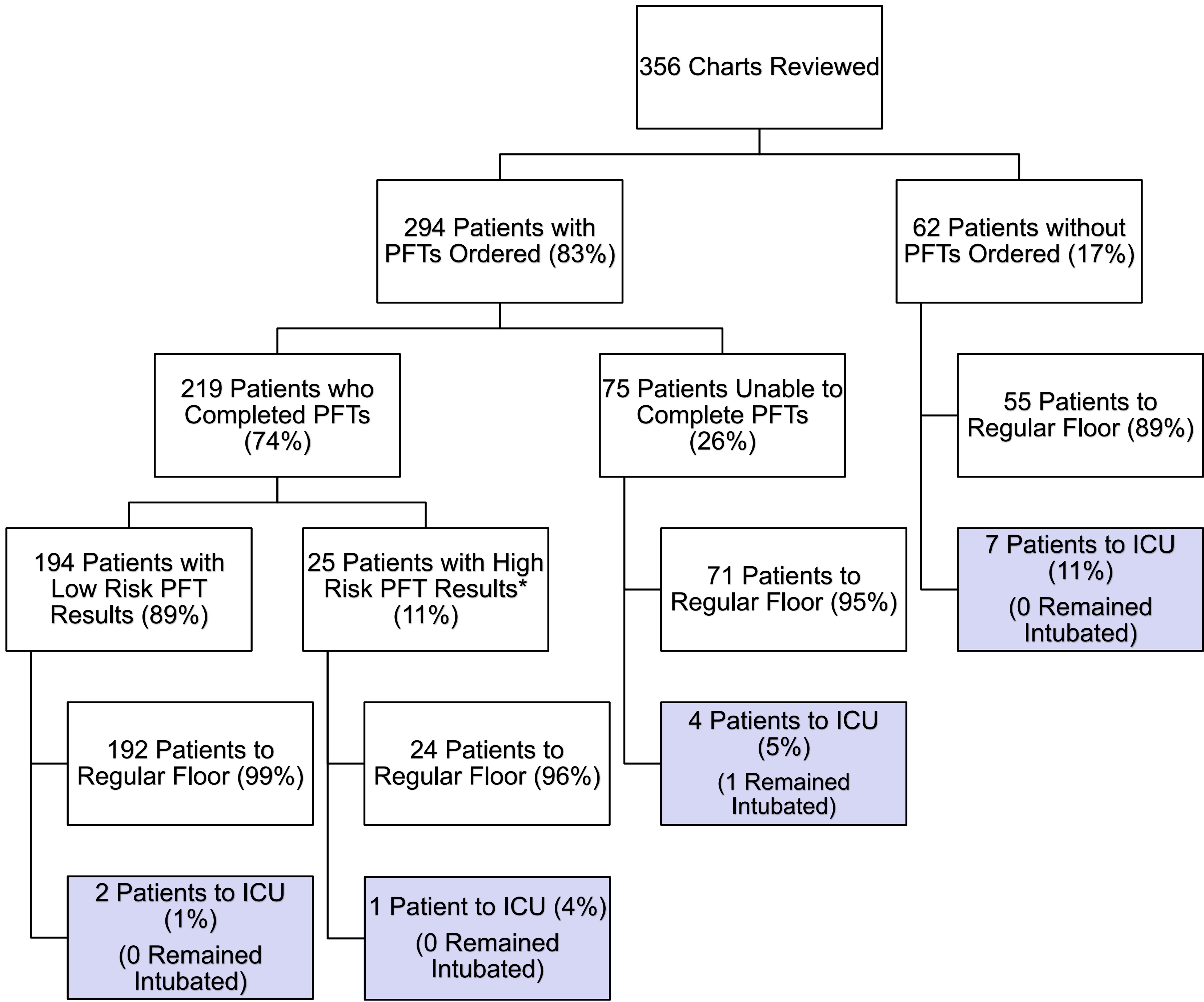
Preoperative Patient Characteristics, n=356

	Mean	SD
Age, years	14.7	2.5
Weight, kg	54.1	12.0
Height, cm	161.5	10.5
Cobb Angle, degrees	56.6	12.0
FVC, % predicted	93.5	15.9
MIP, cm H ₂ O	59.7	22.2

	ASA 1	ASA 2	ASA 3
ASA Physical Status, n (%)	92 (26%)	242 (68%)	22 (6%)

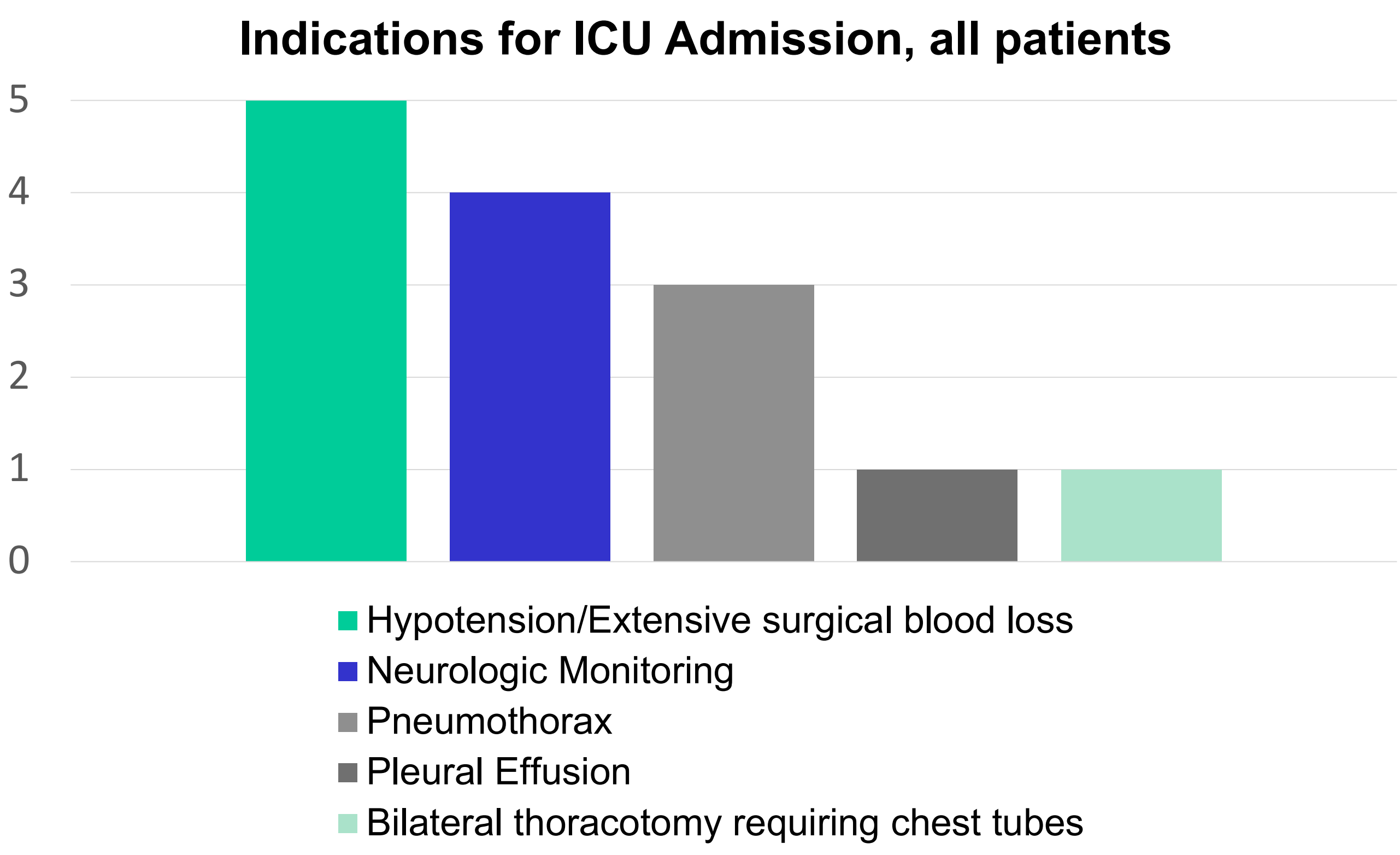
Female Sex, n (%)	273 (77%)
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Results



* High Risk PFT results defined as FVC<40% or MIP <30 cmH2O

Disposition of patients with complete PFT results				
	ICU Admission	No ICU Admission	Total	
High risk PFT results	1	24	25	PPV = 4%
Low risk PFT results	2	192	194	NPV = 99%
Total	3	216	219	
	Sensitivity = 33%	Specificity = 89%		



Results

- Fourteen total patients were admitted to the ICU, for an overall rate of 3.9%.
- Rate of ICU admission among patients with high risk PFTs was 4%.
- No postoperative pulmonary complications were due to respiratory failure secondary to preexisting respiratory mechanics.
- Only one patient with high risk PFTs required postoperative ICU admission. The indication for ICU level care was hypotension in the post-anesthesia care unit.
- All patients studied save for one were extubated successfully in the operating room. One patient, who had incomplete PFTs, remained intubated postoperatively for hypotension and a large pneumothorax. This patient was extubated in the ICU on POD0 following chest tube placement.

Discussion

- Patients with AIS frequently produce uninterpretable or non-reproducible PFT results.
- Pulmonary complications among patients with AIS undergoing PSF are rare, even among patients with high risk preoperative PFTs.
- Only one of the 356 patients studied remained intubated post-operatively, and this was due to a surgical complication.
- The cost of PFTs is \$1,471 per patient. Elimination of preoperative pulmonary function testing would result in a significant decrease in health care resource utilization.

Conclusion

- PFTs do not reliably predict perioperative risk in otherwise healthy patients undergoing posterior spinal fusion, and should not be routinely performed for risk stratification of these patients.

References

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