Factsheet: Adult and Pediatric Complex Surgery

Measure Background

Three decades of research have consistently demonstrated that patients that have their high-risk surgery at a hospital and by a surgeon that have more experience with the procedure have better outcomes, including lower mortality rates, lower complication rates, and a shorter length of stay than for patients who have their surgery done at a hospital or by a surgeon with less experience.[1-27] A recent study of cancer surgeries by the California Health Care Foundation further points to the relationship between very low volumes of cancer surgeries and poor patient outcomes.[28] The study concluded that there is an association between low hospital surgery volume and higher mortality and complication rates for the following cancers: bladder, brain, breast, colon, esophagus, liver, lung, pancreas, prostate, rectum, and stomach. The study also found that the majority of California's hospitals performed surgery for one or more of these 11 cancers only once or twice in 2014. Of cancer patients who had surgery at a hospital that did a small number of those surgeries in 2014, more than 70% were within 50 miles of a hospital performing higher volumes.

A more recent study found that most US health systems had one or more hospitals performing a low-volume surgery that is associated with inferior surgical outcomes despite the availability of a different in-network hospital that met the volume standard. On average, patients would need to travel no more than 30 miles to reach the in-network high-volume hospital.[1]

Furthermore, a study of the relationship between surgeon volume and outcomes for eight cardiovascular procedures and cancer resections showed that surgeon volume was significantly related to operative mortality for all eight procedures studied.[29] The adjusted odds ratios for operative death among patients of low-volume surgeons as compared with patients of high-volume surgeons were as high as 3.61.

Lower surgical mortality at high-volume hospitals does not simply reflect more skillful surgeons and fewer technical errors with the procedure itself. More likely, it reflects more proficiency with all aspects of care underlying successful surgery, including patient selection, anesthesia, and postoperative care.[30]

Surgical Volume

Based on the research by Dartmouth-Hitchcock Medical Center, Michigan Medicine, and Johns Hopkins Medicine, as well as guidance from Leapfrog's National Surgical Expert Panel, Leapfrog has identified eleven high-risk procedures for which there is a strong volume-outcome relationship. The procedures are:

- Bariatric surgery for weight loss
- Esophageal resection for cancer
- Lung resection for cancer
- Pancreatic resection for cancer
- Rectal cancer surgery
- Carotid endarterectomy
- Open aortic procedures
- Mitral valve repair and replacement
- Norwood procedure
- Total knee replacement
- Total hip replacement

Hospital and Surgeon Volume Standards

To achieve the standard for each applicable procedure, hospitals must:
1. Meet the minimum hospital volume standard for the procedure and
2. Have a process for privileging surgeons that includes the surgeon meeting or exceeding the minimum annual surgeon volume standard for the procedure

To achieve the standard for mitral valve repair and replacement procedures, a hospital must:

1. Meet the minimum hospital volume standard for the procedure
2. Have a process for privileging surgeons that includes meeting or exceeding the minimum annual surgeon volume standard for the procedure
3. Participate in the Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD)
4. Have a Mitral Valve Repair/Replacement Composite Score of 3 Stars

To achieve the standard for Norwood procedure, a hospital must:

1. Meet the minimum hospital volume standard for the procedure
2. Have a process for privileging surgeons that includes meeting or exceeding the minimum annual surgeon volume standard for the procedure
3. Participate in the Society of Thoracic Surgeons (STS) Congenital Heart Surgery Database (CHSD)

The procedures and their corresponding minimum hospital volumes and minimum annual surgeon volumes for credentialing are shown in the table below.

Procedure	Annual Hospital Volume	Annual Surgeon Volume for Privileging
Bariatric surgery for weight loss	50	20
Esophageal resection for cancer	20	7
Lung resection for cancer	40	15
Pancreatic resection for cancer	20	10
Rectal cancer surgery	16	6
Carotid endarterectomy	20	10
Open aortic procedures	10	7
Mitral valve repair and replacement	40	20
Norwood procedure	8	5
Total knee replacement	50	25
Total hip replacement	50	25

Download the complete Leapfrog Hospital Survey scoring algorithms document at Hospital Scoring and Results webpage.

Why Purchasers Need to Get Involved

Because lower volumes of high-risk surgeries have been tied to poorer surgical outcomes, such as increased rates of mortality and complications, purchasers can help save thousands of patients' lives by guiding them to hospitals and surgeons that meet or exceed the outlined surgical volume standards. Furthermore, surgical complications are costly mistakes. Not only do surgical complications increase the cost of surgery they also increase the risk of costly readmissions. Research has shown that hospitals that have very low volumes for particular surgical procedures place patients at a significantly higher risk of death or unplanned readmission. To avoid the risk of increased costs due to surgical complications and readmissions, purchasers should be encouraging patients to seek their surgeries at hospitals and by surgeons that have met or exceeded minimum volume standards.

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For a comprehensive list of references please review the Hospital and Surgeon Volume Bibliography, available here: https://ratings.leapfroggroup.org/measure/hospital/2025/complex-adult-and-pediatric-surgery