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SNS RESEARCH BRIEF SUMMARY

The volume-outcome relationship in healthcare *

Research has consistently found that hospitals with higher patient volumes have better patient outcomes than smaller hospitals, more or less regardless of the type of disease or treatment. The mechanism behind this association has often been explained from the perspective of "practice makes perfect." In other words, healthcare professionals and provider organizations learn from experience, which in turn may enhance patient outcomes through, for example, a reduced risk of medical errors. Thus, low patient volumes in some areas of healthcare, such as surgical removal of cancer tumours, have prompted authorities in several countries, including the United Kingdom, the Netherlands, and Denmark, to undertake reorganizations of the healthcare system. Furthermore, in the United States, several professional organizations in the healthcare sector have advocated for establishing minimum volume standards for certain med-ical procedures as an indicator of high-quality care. However, it is crucial to distinguish be-tween patterns of correlation versus causation in this context. Whereas a correlation refers to an unspecified association between two variables, such as quality of care and patient volume, causation suggests a causal link from one variable to the other. Correlation does not imply causation per se. Therefore, it is crucial to understand the direction of the relationship before implementing any reforms.

This report focuses on Swedish cancer care. The empirical association between the annual number of surgical procedures for the removal of breast, prostate, and colorectal cancer tu-mours and patients' post-surgical survival likelihood suggests that hospitals operating at annu-al volumes of more than one hundred patients have substantially higher post-surgery survival rates than hospitals with less than one hundred annual patients. Thus, based on the hypothesis of learning from practical experience, one interpretation of the observed relationship is that many lives could be saved if all patients from hospitals with low surgical volumes instead were treated in hospitals with larger volumes.

Interpreting such descriptive relationships as evidence that volume effects exist is associated with a number of problems, because there also exist a number of competing explanations that can generate the same observable pattern, but which have nothing to do learning form experi-ence. For example, it could be that larger surgical departments have the means to invest in superior medical technology, or the effect could be due to other organizational differences between small and large departments. In addition, an increased concentration of health care resources has other, potentially negative, consequences for the quality of care, such as longer distances to care for both patients and relatives, increased stress for healthcare personnel, and longer care queues from larger patient volumes

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within remaining care units. It is therefore of the utmost importance that such pervasive reforms are based on correct interpretations of ex-isting facts.

This report is based on a research article by Avdic, Lundborg, and Vikström, published in *Journal of Health Economics* in 2019. The study reports estimates and simulations of volume effects, based on an empirical analysis of closures of cancer surgery departments in Swedish hospitals between 1998 and 2007. The closures led to a sharp increase in surgical volume at remaining hospitals via inter-hospital patient transfers. The advantage of this type of analysis is that it is possible, with relatively weak assumptions, to interpret the results of the relation-ship between changes in a hospital's patient volume and patient outcome as a causal effect of volume on quality. These effects are of utmost importance in both the formulation and im-plementation of public measures in order to increase the quality and efficiency of health care.

Results from the analysis showed considerable positive effects of increased hospital volume. Long-term patient survival increased while the risk of complications and reoperations de-creased, without substantial increases in the length of hospital stay. Policy simulations with the introduction of national minimum volume limits highlight the balance between centraliza-tion and quality of care. Furthermore, analyses suggested that the saying "practice makes per-fect", has truth to it. The centralization of cancer care meant that surgeons increased their an-nual number of surgeries by an average of 25 percent. Therefore, the positive volume effects are likely the result of increased practical experience among the practicing surgeons, rather than changes in medical technology or more general organizational changes.

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* This is a summary of the Swedish research brief "Sambandet mellan volym och kvalitet inom sjukvården", presented Wednesday 18th of December 2019.