Variations in rates of appendicitis with peritonitis or peritoneal abscess in the context of reorganizing healthcare in Montreal-Centre

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Key Implications for Decision Makers

Restructuring of the healthcare system and cuts to relevant human resources for treating acute appendicitis coincided with a constant increase in the rate of peritonitis. There was also major variation in the rates of peritonitis among hospitals. The study seeks to determine whether the change in access to healthcare and services may have led to more peritonitis or peritoneal abscess, as well as variations in these rates over time and among hospitals.

- Despite significant transformations in relevant human resources and improvement in technical equipment for diagnosis, the rate of peritonitis in cases of acute appendicitis did not change between 1993 and 1999, and major variations (from 8 to 31 percent) persist between hospitals.

- The factors associated with a high rate of peritonitis are delays in receiving treatment, high-activity volumes, and the ratio of these volumes to the resources available (pressure).

- The pre-hospital delay is clearly associated with a high rate of peritonitis. When the patient seeks treatment outside the emergency room, this delay is longer, and the frequency of appendicitis rises among adults. Appendicitis is difficult to diagnose, and diagnosis is largely based on clinical reasoning. Physicians in the healthcare system therefore should keep in mind the possibility of this diagnosis when seeing adult patients.

- Higher rates of peritonitis are associated with shorter waits in the emergency room. This might be explained by patients becoming a priority for operation when they develop peritonitis — a plausible interpretation as more than 75 percent of cases of acute appendicitis wait longer than the clinical standard of six hours before undergoing surgery.

- The system has reached the point where it can no longer respond quickly to the most urgent cases: the delays between departure from the emergency room and surgery (median of 55 minutes, with a waiting time of more than five hours in 25 percent of cases) suggest a problem with access to operating rooms.

- Decision makers who wish to use administrative databases as a source of valid information for decision-making, especially when analysing performance or allocating resources, must pay special attention to the lack of precision in codifying diagnoses in hospitals.
Executive Summary

Context

This study was conducted after observing a steady increase in the rate of peritonitis and a large variation in these rates among hospitals, based on statistics drawn from databases on hospitalizations in Montreal. These increases coincide with major changes in the organization of healthcare services (hospital closures, shift to ambulatory care) and in the availability of technical equipment (ultrasound and scans).

The purpose of the study was to understand how a potential change in access to healthcare could lead to increased rates of peritonitis or peritoneal abscess, as well as variations in these rates over time or among hospitals. The factors studied were components of the reconfiguration that might influence delays due to the availability of resources, or the clinical process leading to diagnosis.

The scope of the problem lies largely in its consequences. The presence of peritonitis or peritoneal abscess leads to a significant rise in intra-hospital mortality and an even greater increase in morbidity. It also leads to extended hospital stays, increased hospital costs, and lost work time for patients or relatives.

Delays

The research examined how pre-hospital and hospital delays — two factors that play an intermediary role between patient characteristics and healthcare system characteristics — contribute to the appearance of complications such as peritonitis.

In the results, as well as the survey of the literature, pre-hospital delays (median of 24 hours) were clearly associated with a high rate of peritonitis. This delay is longer where there is medical consultation in the days preceding arrival in the emergency room (83.2 percent of patients consulting a family physician have a longer delay than the median). However, the shorter the time spent in the emergency room, the higher the rates of peritonitis. This may be explained by the fact that patients do not become a priority for
operation until they develop peritonitis. This interpretation is particularly plausible, as 75 percent of cases of acute appendicitis wait longer than the clinical standard of six hours before undergoing surgery (the median for the total hospital delay is 12.2 hours). These results suggest that the system has reached the point where it can no longer respond quickly to the most urgent cases.

**Factors in inter-hospital variations**

The analysis also sought to determine how hospital characteristics contribute to peritonitis rates. Overall, hospitals with high volumes of activity tend to have high peritonitis rates. When the high volume is linked with the resources available (pressure exerted on resources), the results differ: while peritonitis rates rise when the level of pressure rises from low to medium, they decline when the level of pressure increases from medium to high. These results imply the contribution of other organizational or human factors that may offset the effect of a high pressure level (for example, criteria for priority access to operating rooms, interpersonal and inter-professional relations, financial incentives, or great availability of operating resources to respond to emergencies).

These factors do not, however, explain all the differences among hospitals. Significant variations in peritonitis rates (from 8.5 to 31.3 percent) persist even after taking these factors into account.

**Incidence among adult patients**

Acute appendicitis is no longer solely a disease of the young: more than 70 percent of cases occur in adults, and the frequency within this group is rising. Furthermore, as age increases, the associated peritonitis rate rises to a level as high as that for very young children. Given the fact that elderly people are more likely to consult before coming to the emergency room, and since contacts with the healthcare system are associated with longer delays, physicians in the system should keep in mind the possibility of acute appendicitis when diagnosing adults and elderly patients. This is especially important since diagnosis of this disease is difficult and is broadly based on clinical reasoning.
Validity of administrative data

The study used data from databases for the period April 1993 to March 1999. It also included an analysis of files from a sample of patients for the last fiscal year and gathered information from key people (directors of professional services, emergency rooms, and anesthetic and surgical services in Montreal’s 14 main hospitals).

The information obtained from the interviews showed that changes did in fact occur in the healthcare system and that these transformations led to a reduction in relevant human resources for treatment of acute appendicitis (emergency, anesthetic, and surgical services).

Analysis of files from a sample of patients identified from the databases allowed an archivist to code all the diagnoses from the clinical information available (clinical notes, surgeon’s report, and pathology report). The database codes and those taken from the files were then compared. Frequent disagreements emerged between hospital archivists and the study’s archivist. Their frequency varied greatly from one hospital to another, enough to invalidate any conclusion drawn from an analysis based solely on the databases (rate of disagreement between hospital archivists and the study’s archivist ranged from 2.4 to 61.5 percent).

Although peritonitis rates were expected to rise based on the preliminary data, the rates from databases (corrected for coding errors observed in 1998-1999 and adjusted to compare patients similar in age, gender, co-morbidity, and socio-economic status) remained the same from 1993 to 1999 (between 14 and 20 percent). In a setting where technical capacity to support diagnosis of appendicitis has improved, this result suggests that acute appendicitis continues to be a challenge to diagnose, a challenge that must be met through examination and clinical reasoning.