Registration and analysis of surgical complications: Bearing the burden of broken butterflies
Visser, A.

Citation for published version (APA):
Visser, A. (2015). Registration and analysis of surgical complications: Bearing the burden of broken butterflies
The ‘Medusozoa’ had lost her body and antennae and could no longer fly. She was given a new set of flying tools and a propeller. Anne ten Donkelaar.
Chapter 5

Surgeons Are Overlooking Post-Discharge Complications:
A Prospective Cohort Study

Annelies Visser
Dirk T Ubbink
Dirk J Gouma
J Carel Goslings

CHAPTER 5      POST-DISCHARGE: PATIENT VERSUS SURGEON

ABSTRACT

Introduction: The registration of surgical complications is an important quality indicator of hospital medical care. Previous research has suggested that surgeons only record certain complications after discharge. The extent and impact of this potential under-recording of post-discharge complications is unknown. Therefore, we aimed to determine the frequency, type, and grade of post-discharge complications as reported by patients and their surgeons.

Methods: A prospective cohort study was performed in the Department of Surgery of a University Medical Centre. From December 2008 until August 2009, all adult surgical patients were interviewed by phone or questionnaire 1 month after their discharge to inquire about any new complications after discharge. These complications were compared with the surgeon-reported post-discharge complications and letters from the outpatient clinic as documented in the patients’ medical files.

Results: A total of 976 patients were included. Patients reported more complications (659) than did surgeons (465), especially psychological disturbances (4.2 vs. 0%). A medical consult was needed in 527 (80%) of the patient-reported complications. Of all patient-reported complications, 291 (44%) resulted in a visit to the outpatient clinic, 144 (22%) in a consultation with a general practitioner, and 92 (14%) led to referral to a hospital; 743 (76%) were treated non-operatively.

Conclusion: Surgeons are unaware of many of the complications their patients experience after discharge. These post-discharge complications are important to patients and are therefore relevant to be aware of and to act upon whenever necessary.
INTRODUCTION

Complications are an inherent risk of surgical interventions. They generally lead to reduced patient health outcomes, can cause irreversible damage, or require a change in therapeutic planning, which can result in a prolonged hospital stay and increased costs.\textsuperscript{1,2} Registration of these complications is becoming increasingly important as a quality indicator of hospital care.\textsuperscript{3-5}

While patient monitoring and registration of complications during hospitalization is a routine procedure, this is performed less consistently after discharge, either in the outpatient clinic by the surgeon or by general practitioners (GPs). Surgeons therefore tend to have an incomplete view of their patients’ complications after discharge. However, which and how many post-discharge complications surgeons miss or do not record is unknown.

The generally accepted definition of a post-discharge surgical complication in the Netherlands is “an adverse outcome occurring between discharge and 30 days after discharge”.\textsuperscript{6} Recent studies have shown high rates of post-discharge complications, but most studies do not include these as an outcome parameter. A previous study showed that 25% of all patients in a general surgical practice experienced post-discharge complications.\textsuperscript{7} Other studies have shown that between 41.5 and 58% of all complications occur after discharge.\textsuperscript{8,9} However, these studies did not report on the differences between surgeon-reported and patient-reported complications and their severity grade.

More accurate information on complications after discharge may provide a more reliable estimate of all surgery-related complications. Post-discharge complications may have an impact on patients and are therefore relevant to be aware of and to act upon when necessary. The aim of this study was therefore to compare the number, type, grade, and treatment of complications in surgical patients after discharge as reported by surgeons and patients.

METHODS

A prospective cohort study was performed at the Department of Surgery of the Academic Medical Centre, a university hospital in Amsterdam, the Netherlands. This study was reported in accordance with the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) statement.\textsuperscript{10} The medical ethics board waived the need for approval, as the study did not interfere with the treatment of patients, and the interview would not cause a serious psychological burden.

The definition of a post-discharge complication as used for this study was “An unintended and unwanted outcome or state that occurs in the 30-day period after discharge and is so harmful to the patients’ health that it requires (adjustment of) treatment or leads to permanent damage”.\textsuperscript{6,11}
Patients
From December 2008 until August 2009, all adult surgical patients admitted to and discharged from six surgical wards (general, vascular, trauma, gastrointestinal surgery [two], and day surgery) were eligible for this study. Patients who had died, had no forwarding address, or had been readmitted after a previous hospitalization within 30 days were excluded from the study, because these patients were unable to report post-discharge complications.

Only patients who completed the questionnaire were included, because data were needed from both sources (questionnaire vs. medical file and outpatient letter) to be able to compare the information from patients and surgeons about the complications they perceived. Furthermore, if the patient’s medical file and outpatient letter could not be retrieved 30 days after discharge, the patient was excluded from our analysis, because information was lacking about the complications the surgeon had recorded.

Collecting Patient-reported Complications
At discharge, patients were informed that they would be contacted after 30 days by phone or by mail to collect information about any new complications they may have sustained during the period after discharge. The researcher who performed the telephone interviews and sent the questionnaires was blinded to both the patient’s medical condition and the treatment given. Patients were interviewed by trained interviewers who used a structured, predefined set of interview questions. Methodological details are described in a previous publication.12

During this interview, the patients were first informed about the definition of a complication and the period of concern (between discharge and 30 days thereafter) and were then asked to report any new complications occurring during that period.

Collecting Surgeon-reported Complications
Medical files and outpatient clinic letters of all respondents were checked for surgeon-reported post-discharge complications, and collected by a medical student who was familiar with the definitions used in this study, but blinded to the patient-reported complications and treatments the patients had undergone. Data were collected on frequency, type, grade, and treatments of complications reported.

Additional Data Collected
Relevant patient characteristics were also retrieved from medical dossiers and electronic hospital databases, including age, gender, day surgery or hospital admission, American Society of Anaesthesiologists classification, in-hospital complications, length of hospital stay, type of surgery, complexity of surgery. The latter was defined according to the surgery
complexity scale used by the Dutch Surgical Association, ranging from 1 for ‘simple’ to 7 for ‘complex’ procedures.\textsuperscript{11} For admissions with more than one surgical intervention, the surgical procedure with the highest surgical complexity was defined as the main operation. ‘High complexity’ was defined as 6 or 7 on the surgical complexity scale.

Data Analysis
Reported complications were classified according to the Dutch national surgical complication registration system (LHCR), as developed by the Dutch Surgical Association and based on national and international standards.\textsuperscript{11} Complication grade was categorized using the four-level grade scale as developed and described by Clavien et al.; (0) temporary health disadvantage without treatment; (1) recovering without (re)operation; (2) recovery after (re)operation; (3) probably permanent damage or function loss; and (4) death.\textsuperscript{13} Complications requiring an interventional radiological treatment (e.g. percutaneous drainage) were categorized as non-operative treatment (grade 1) rather than a true re-operation in the operating room (grade 2).

Data were entered in Microsoft\textregistered Access version 2003 (Microsoft Inc., Seattle, WA, USA) and exported into IBM Statistics version 20 (IBM Inc., Armonk, NY, USA) for further analysis. Frequencies were expressed as means and standard deviations, or medians and inter-quartile ranges (IQR) if the distribution was skewed. Crude complication percentages were compared statistically, i.e., without matching the specific types of complications as mentioned by surgeons and patients, using the Chi-squared test. McNemar’s test was used to test the significance of the differences between paired proportions, i.e., to analyse statistically the amount of disagreement between patients and surgeons about whether or not a complication had occurred. The differences in frequency, type, and grade of reported complications were expressed as risk differences (RD), including their 95% confidence intervals (CI).

RESULTS

Over an 8-month study period, a total of 2768 clinical admissions were registered. These patients were approached for an interview or questionnaire; 6% of the patients could not be reached (N = 165). Reasons for exclusion are shown in figure 1. The final response rate was 58%. Data from 976 patients (61%) were obtained and analysed. Patient characteristics and the types of surgery they underwent are detailed in Table 1. One-fourth of the surgical procedures (N=187; 25.3%) were rated as ‘high complexity’ (Table 1). Of the 976 respondents, 16% (N=159) had at least one in-hospital complication, resulting in 300 registered in-hospital complications.
Of all patients, 420 (43%) reported one or more complications after discharge, which was significantly (p<0.001) higher than the number of patients with post-discharge complications according to the surgeons (N=363; 37%; RD 5.8%, 95% CI 2.2–9.5). Moreover, patients and surgeons did not agree on whether a post-discharge complication had occurred (p<0.001; McNemar). Patients also reported more post-discharge complications than did surgeons (659 vs. 465, respectively; p<0.001). Surgeons rarely registered more than three complications, while some patients reported four to six complications (N=19; see figure 2).

**Figure 1** Flow diagram of patient inclusion and analysis
Figure 2. Number of patients with 0–6 complications in the 30 days after discharge period: surgeon-reported complications versus patient-reported complications

Table 1. Characteristics of responding patients

<table>
<thead>
<tr>
<th></th>
<th>Total N=976</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males: N (%)</td>
<td>515 (52.8)</td>
</tr>
<tr>
<td>Median age (IQR*)</td>
<td>56.6 (43.6-67.6)</td>
</tr>
<tr>
<td>Median hospital stay in days (IQR*)</td>
<td>5.0 (2.0-10.0)</td>
</tr>
<tr>
<td>In-hospital complication rate (%)</td>
<td>159 (16.3)</td>
</tr>
<tr>
<td>In-hospital complications: N</td>
<td>300</td>
</tr>
<tr>
<td>Surgery: N (%)</td>
<td>743 (76.1)</td>
</tr>
<tr>
<td>Day-surgery</td>
<td>116 (15.4)</td>
</tr>
<tr>
<td>Clinic</td>
<td>627 (84.6)</td>
</tr>
<tr>
<td>Type: N (%)</td>
<td></td>
</tr>
<tr>
<td>Gastro-intestinal</td>
<td>326 (33.4)</td>
</tr>
<tr>
<td>Vascular</td>
<td>60 (8.1)</td>
</tr>
<tr>
<td>Trauma</td>
<td>166 (22.5)</td>
</tr>
<tr>
<td>Other</td>
<td>187 (25.3)</td>
</tr>
<tr>
<td>Surgical procedure complexity level ≥ 6: N (%)</td>
<td>187 (25.3)</td>
</tr>
</tbody>
</table>

* IQR = Inter-Quartile Range
The complication types as reported by surgeons and patients are summarized in Table 2. The most frequently reported complication types were symptoms without specific diagnoses (e.g. pain or fever), infections, and functional disorders (e.g. bowel or cardiac problems, weight loss). Patients reported significantly more complications related to the surgical site (RD 2.2%; 95% CI 0.8–3.5), and psychological disturbances (RD 4.3%; 95% CI 2.7–5.8), whereas surgeons did not register any such complications. Surgeons reported significantly more abnormal wound healing than patients (RD 5.9%; 95% CI 2.9–8.9).

Table 2. Types of complications of patients with one or more complications in the 30 day-period after discharge: surgeon- versus patient-reported complications

<table>
<thead>
<tr>
<th></th>
<th>Surgeon-reported N=465</th>
<th>Patient-reported N=659</th>
<th>% Risk difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms without diagnoses, e.g. fever, pain, nausea</td>
<td>156 (33.5%)</td>
<td>238 (36.1%)</td>
<td>2.6 (-3.1 to 8.2)</td>
</tr>
<tr>
<td>Inflammation/infection, e.g. abscess, (wound) infection</td>
<td>106 (22.8%)</td>
<td>139 (21.1%)</td>
<td>-1.7 (-6.6 to 3.2)</td>
</tr>
<tr>
<td>Functional disorder, e.g. bowel problems, weight loss, numbness, insomnia, cardiac problems</td>
<td>63 (13.5%)</td>
<td>98 (14.9%)</td>
<td>1.3 (-2.8 to 5.5)</td>
</tr>
<tr>
<td>Abnormal wound healing, e.g. dehiscence</td>
<td>43 (9.3%)</td>
<td>22 (3.3%)</td>
<td>-5.9 (-8.9 to -2.9)</td>
</tr>
<tr>
<td>Accumulation/leakage of body fluids, e.g. gall/chyle leakage or accumulation</td>
<td>29 (6.2%)</td>
<td>55 (8.4%)</td>
<td>2.1 (-0.9 to 5.2)</td>
</tr>
<tr>
<td>Bleeding/hematoma, e.g. abdominal, anal, limbs, groin</td>
<td>24 (5.2%)</td>
<td>36 (5.5%)</td>
<td>0.3 (-2.4 to 3.0)</td>
</tr>
<tr>
<td>Injury by mechanical, physical or chemical cause, e.g. loose suture or dislocated drain, re-rupture, pins piercing skin</td>
<td>2 (0.4%)</td>
<td>17 (2.6%)</td>
<td>2.2 (0.8–3.5)</td>
</tr>
<tr>
<td>Psychological disturbance, e.g. depression, delirium</td>
<td>0</td>
<td>28 (4.2%)</td>
<td>4.3 (2.7–5.8)</td>
</tr>
<tr>
<td>Other, e.g. allergy, pressure sores, fistulae, thrombosis</td>
<td>42 (9.0%)</td>
<td>26 (4.0%)</td>
<td>-5.0 (-2.1 to -8.1)</td>
</tr>
</tbody>
</table>

Of the reported post-discharge complications 94% were treated non-invasively (Table 3). Grade 0 complications were reported more frequently by the surgeon than by the patient (RD 9.9%, 95% CI 4.2–15.6). Patients reported significantly more grade 2 complications (RD 2.7%, 95% CI 0.7–4.6) than the surgeons did.

Patients sought medical help or advice for 84% (N=527) of the complications they reported. Of these, more than half (N=291) presented to the outpatient clinic (27 of which were in
another hospital), while 92 complications were seen in the Emergency Department. For the remaining 144 (27%) complications, GPs were consulted (Fig. 1). The complications presented to GPs concerned pain (N=39), infection (N=32), and wound problems (N=11). These complications were all treated non-surgically.

Table 3: Number of complications of patients with one or more complications by grade in the 30-day period after discharge: Surgeon-reported vs. patient-reported

<table>
<thead>
<tr>
<th>Surgeon-reported</th>
<th>Patient-reported</th>
<th>% Risk Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of complications</td>
<td>465</td>
<td>659</td>
</tr>
<tr>
<td>Grade 0</td>
<td>195 (42%)</td>
<td>211 (32%)</td>
</tr>
<tr>
<td>Grade 1</td>
<td>258 (56%)</td>
<td>388 (59%)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>6 (1.3%)</td>
<td>26 (4.0%)</td>
</tr>
<tr>
<td>Not reported</td>
<td>6</td>
<td>34</td>
</tr>
</tbody>
</table>

* Pearson Chi-square

**DISCUSSION**

This prospective cohort study shows that surgical patients report more post-discharge complications than do their surgeons, and experience more, albeit mild, complications after discharge than during hospitalization. Apparently, surgeons tend to overlook post-discharge complications among their patients, some of which warrant additional surgical care. Hence, surgeons should look harder for post-discharge complications with which they should be dealing.

Although some complications may require only non-operative treatment and may be taken care of by the patient’s GP, patients perceive these complications as important and undesirable, because they seek help for them by visiting their GP, an outpatient clinic, or an Emergency Department. Surgeons should therefore better inform their patients at discharge that complications may still occur and how they can detect such complications, especially wound infection, and discuss their role in preventing complications, especially regarding pain and wound infection.

Although surgeons reported more complications requiring no additional treatments, they missed others, some of which required treatment by GPs. It is possible that surgeons do not document every complication they recognize in their patients. In particular, the higher-grade complications tended to be omitted, although these are more likely to be documented than those not requiring medical treatment. In our study, 40% of surgical patients reported post-discharge complications, which is higher than reported in previous studies.7–9 It is likely that this figure also included complications that did not require medical advice.
The finding that patients reported more higher-grade complications than did surgeons may be because patients graded interventions such as re-stitching, opening the wound, and radiological investigations as grade 2, whereas surgeons rated them as grade 1. Another explanation could be the finding that patients did not report less severe post-discharge complications to their surgeon, but consulted their GPs for these and were treated there. Thus, the surgeon may not have been informed about these complications.

Wound infections were the only post-discharge complications reported more frequently by surgeons than by patients. Wound infection is one of the nationally recognized indicators for quality of care and patient safety (The Health Care Inspectorate, www.igz.nl/english). Hospitals are obliged to register wound infections and to report their incidence to the Inspectorate. This obligatory reporting may have been exemplified by our findings.

Despite the discrepancies found between complications perceived by surgeons and patients, the current definition of a complication remains valid, as it is an accepted and practical definition among surgeons when recording complications after surgery. Furthermore, screening for complications may well be carried out by trained surgical assistants as was found in our previous trial. The current method was found to be clear enough to be used by assistants, which may save time for the surgeon.

Although post-discharge complications seen by GPs tend to be missed by surgeons, the question remains whether hospitals should be willing to invest time and money in registering all complications, including those occurring after discharge. This may require the use of more resources to detect and record such complications, while complications after discharge leading to re-admission, reoperation, or death will usually be recorded in the current registration. What pleads in favour is that quality of care has become an important aspect of transparency of care, and complications is one of these parameters. Surgeons can also use these complication data to inform the patient about the risks of surgery. However, complications missed by the surgeon are mostly, and fortunately, the (less severe) complications that can be dealt with by a GP. Hence, it is most likely not cost effective to strive to collect and record all these complications.

Study Limitations

First, our medical files were digitalized during this study, sometimes resulting in restricted access to medical records. This partly explains why the records of 456 respondents were irretrievable at that time. Another reason is that the patient had to be excluded from our analysis if the medical file or outpatient letter could not be retrieved, because in that case we would not be fully informed about what the surgeon had recorded as complications. This might have led to selection bias, although it is unlikely that these drop-outs caused substantial bias, in terms of more or less complications than when the files could be retrieved completely.
Second, it is debatable whether patients can reliably report complications and whether they might give socially desirable answers. Patients may have difficulty determining whether their complaint fits the definition of a complication and which intervention is to be counted as a re-operation. Even among medical specialists, such definitions can be ambiguous.\textsuperscript{15} Other studies have shown that patients are clearly in a position to report issues related to patient safety.\textsuperscript{5,16} However, none of these studies included vulnerable patients and included only the responders. Hence, it is not likely that all patients will be able (or are willing) to be involved. To ensure correct reporting of complications by the patients by any method, the definition of a complication must be clear and strict, so that patient-reported complications are reliable. To ensure correct reporting of complications by surgeons, the sources for recording should be reliable and complete.\textsuperscript{14} These are important prerequisites for the accurate recording and reporting of post-discharge complications.

Third, in this study, the specific complication types mentioned by patients and surgeons could not be matched. Hence, crude complication rates were reported rather than on a patient level. Patients usually have no medical background and might give a different description of their complaint or complication. For example, a single complication could be described by the patient as ‘pain’ or ‘fever’, while the surgeon could document the same as ‘wound infection’.

Fourth, patients who were readmitted or had died at the time of the interview, 30 days after discharge, were excluded. Readmission, reoperation, and death are registered in our complication registry and are considered to be the most severe complications. Due to this exclusion, the set of patients studied was less representative for those suffering in-hospital complications. However, this very readmission rendered them unable to complete the questionnaire. Only patients who completed the questionnaire were included, because data were needed from both sources (patient’s questionnaire vs. surgeon’s medical file and outpatient letter) to be able to compare the complications reported by patients and surgeons. In doing so, we missed the complications that might have been reported by readmitted patients. However, our current registration records in-hospital complications, while those occurring after discharge are not registered unless resulting in readmission or/and reoperation.

Finally, the primary aim of our study was to assess whether or not surgeons overlook any of the complications patients complain of after discharge, and how these are dealt with. Further research should address the impact of the complications missed after discharge, for example, in financial terms, methods by which post-discharge complications should be captured or managed, or how post-discharge complications can be prevented.
CONCLUSION

One in four post-discharge complications in surgical patients are missed by the treating surgeon. Most of these patients with complications are seen and treated by GPs. Surgeons should anticipate common post-discharge complications and communicate with their patients about what to do, should this happen, to avoid unnecessary involvement of, or referral to, other healthcare professionals.
REFERENCES