CORRESPONDENCE

Letter to the Editor:

Mortality and Complications Following Visceral Surgery

A Nationwide Analysis Based on the Diagnostic Categories Used in German Hospital Invoicing Data

by Dr. med. Philip Baum, Dr. med. Johannes Diers, Dr. med. Sven Lichthardt, Dr. med. Carolin Kastner, Prof. Dr. med. Nicolas Schlegel, Prof. Dr. med. Christoph-Thomas Germer, and PD Dr. med. Armin Wiegering in issue 44/2019

Conclusions Are Speculative

Baum et al. in their article (1) report "valid data" on mortality and complications after visceral surgery. From a clinical perspective this claim is not plausible. The authors provided a statistical work-up of invoiced procedures and diagnostic codes. They did not validate the data, they did not check for concordance between financial accounting and clinical reality, their conclusions remain speculative. In Germany, the only purpose of coding is to achieve an as high as possible diagnosis-related groups (DRG) code, on which funding from insurance companies depends directly. In order to defend their methods, the authors cited a US publication from 1994, which, by the way, did not validate its data either. Numerous different reports regarding the problem were not included (2–4).

From a surgical perspective, I also cannot understand the grouping that was undertaken. Procedures with different risks, such as hemicolectomy and rectal amputation, were evaluated within one group, similar to esophageal procedures without reconstruction of continuity and interposition grafts. The authors did not describe how they calculated the 48-hour threshold for ventilation, since obviously this procedure was not defined by using the German procedure classification (*Operationen- und Prozedurenschlüssel*, OPS) but ICD code J953 (International Classification of Diseases). For gastrointestinal bleeding, peritonitis, and blood transfusion it is not known whether these occurred before, during or after surgery. Furthermore, any checking mechanism as to whether the coded procedure was the one that was undertaken is lacking, as no pathological results were evaluated.

Without any doubt, clinically and practice oriented quality measures are needed in Germany. These require much time, labor, staff, and expense and cannot be replaced with any pseudo-reality gleaned from billing data. Not even the quality of restaurants is assessed by means of the names of meals and billing receipts—so why are we doing this to surgically treated patients?

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Indications for Surgery Need to Be Assessed in a Differentiated Way

Baum et al. presented data on mortality and complications after visceral surgery that are based on all inpatient cases in Germany (1). As they quite rightly stated, this data set in principle allows patients to make an informed decision in favor of or against a procedure. To enable patients to balance the risks and benefits of a surgical procedure in a valid way, the disease course that is to be expected without surgery also needs to be outlined in an objective fashion. The authors refer to our meta-analysis of randomized controlled trials of surgical versus antibiotic treatment of uncomplicated acute appendicitis (2) when they define this pathology as a vital indication for surgery. Our results do not support this statement. Over a follow-up period of 12 months, the effectiveness of surgical therapy was 96.3% versus 62.6% for antibiotic treatment; we found no indications signs of a higher incidence of complications or deaths in patients who did not have surgery. However, many surgeons still regard uncomplicated acute appendicitis as an absolute indication for surgery. A similar attitude applied for the longest time to diverticulitis of the sigmoid colon. Only in recent years the evidence-based conception has become established that defined forms of acute diverticulitis of the sigmoid colon can successfully be treated conservatively (3).

Both pathological entities show in an exemplary fashion that realistic, evidence-based assessment of a therapeutic success or disease course is essential for surgical as well as conservative therapy. Considered together with the expected incidence of perioperative complications and death, this assessment enables a differentiated evaluation of indications for surgery and shared decision-making with regard to any possible surgical procedure (4).

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Causes Need to Be Examined More Closely

Among others, the authors report 506 383 hernia operations (TAPP, TEP, Lichtenstein procedures) that were billed by diagnosis-related group (DRG) in the time period 2009–15 (1). The total complication rate of 0.3% (n=1530) includes 458 cases of peritonitis (0.1%), 538 of sepsis (0.1%), and 273 cases of gastrointestinal bleeding (0.1%).

The reported case fatality rate of 0.04% is higher than that reported in the Swedish hernia registry of 0.004% (2). Half of all deaths after an inguinal hernia operation are directly associated with the hernia, although cardiovascular incidents are often reported as the cause. After day-surgery procedures, Jenkins et al. in their study did not report any deaths within the first three months after hernia surgery (3).

The case fatality rate after hernia operations is crucially determined by the following factors:

- The localization of the hernia
- The patient's age
- The severity of disease according to the ASA classification (ASA, American Society of Anesthesiologists)
- Emergency surgery versus elective surgery
- Type of anesthesia
- Delay in diagnosis and treatment.

These factors were not mentioned in the present study for obvious reasons. The literature reports complication rates after TAPP of 1.2–49%, after TEP of 1.3–50.3%, whereas the Herniamed registry documents 5.4% for TAPP and 2.95% for TEP (4).

The study reported by Baum et al. (1) is an important contribution to the epidemiology of visceral surgery, such as herniotomy. The study suggests that the causes of mortality and complications should be examined more closely depending on the type or procedure.

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Inaccuracies

One challenge in analyzing hospital administrative data consists in specifying the units under study on the basis of the available information in such a way that systematic errors and consecutive misinterpretation of the results—for example, as a result of poorly defined groups of treatment cases—are avoided (1). However, we noticed inaccuracies in the case definition by Baum et al. (2), which make it difficult to interpret the results of their study.

On considering the German procedure classification (*Operationen- und Prozedurenschlüssel*, OPS) codes for including study units in *eTable 1* (2) it transpires that the codes are in some cases not consistent with the entities named in the text (p 740). For example, for thyroid procedures (hemithyroidectomy, thyroidectomy), the codes for thyroidectomies are missing. For gastrointestinal surgery (4/5 gastrectomy, gastrectomy), codes for gastrectomies and 2/3 resections are listed, but the code for 4/5 resections is not. For hernia surgery (TAPP, TEP, Lichtenstein procedures), the wrong codes are listed for the Lichtenstein procedure (the codes given, 5–530.33 and 5–530.34, were not yet included in the OPS during the study period).

In the discussion, Baum et al. refer to the analyzed colorectal and gastric resections as "oncological procedures" (p 744, p 745). These study units were, however, only chosen because of procedure codes, without taking into account the relevant diagnostic codes. For example, in fewer than half of all colorectal resections undertaken in German hospitals, colon or rectal carcinoma are coded as the principal or secondary diagnosis (3). This probably also explains the differences in in-hospital mortality in the international comparison, which were discussed in this context.

In conclusion, the statement in the abstract, "The in-hospital mortality after visceral surgery in Germany is unknown" is incorrect. We refer the authors to numerous publications of our working group ([4] may serve as an example) and those of other colleagues.

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In Reply:

As Prof Mrozckowski correctly explains, DRG and OPS (*Operationen- und Prozedurenschlüssel*) codes are generally intended for billing for service rendered. They may bias the results of evaluations and are potentially inferior to data from clinical databases. However, it should be pointed out that one of the main outcome measures of our study (in-hospital mortality) is unlikely to be subject to relevant biases. Furthermore, the German medical services of health insurers, (*Medizinischer Dienst der Krankenkassen, MdK*) check in minute detail the cases billed to health insurers/sickness funds, especially those in which complications occurred and were invoiced (for example, the duration of ventilation).

Furthermore, publications from the US that evaluated administrative data from a database established over 20 years (ACS-NSQIP) showed sufficient concordance of both systems, with billing data—as expected—inferior to registry data (1).

In Germany, no universally clinical database exists that is of a comparable size and extent to the US ACS-NSQIP database. The DGAV-StudoQ registry, for example, as a clinical database in Germany could certainly in future enable the evaluation of individual specific questions and thereby help to set out relevant questions and quality indicators (2, 3). The selective documentation of such registries may, however, be a problem.

Our response to PD Dr Ronellenfitsch: in the meta-analysis, appendectomy is named as the long acknowledged gold standard for any form of appendicitis, and an analysis of alternatives for the different forms of appendicitis is discussed. We think that for many vital indications, surgical procedures are without alternative or superior to other measures.

As Prof Holzheimer comments, the case fatality rate in the German DRG data is higher than the Swedish registry by a factor of 10, which raises the question of the type of documentation and interpretation of the data. The unbeatable advantage in the analysis of billing data is that all patients receiving care are included, without any selection process. For the evaluation of general complications (seroma, wound infection, urinary tract infection, nerve damage, etc) the DRG data do not seem appropriate because they are coded only generally. This needs to be taken into account when comparing the review cited by Prof Holzheimer, in which general complications are described, with our data (only severe complications). No causal associations can be generated from the retrospective studies; the causes will have to be the subject of further studies.

We wish to respond to the methodological comments of Prof Mroczkowski and Drs Nimptsch and Krautz as follows:

For each billed case, the precise hours of ventilation are documented in the DRG code, and we evaluated these. The threshold of 48 hours is a commonly used value in the literature. We cannot draw any conclusions about the temporal sequence of procedures and complications in a treatment case. Accordingly, we evaluated the published complications—as is usual practice in the literature of administrative data (4)—under the assumption that these are likely to develop as events after surgery (for example, peritonitis after gastro-esophageal surgery) (5).

A general challenge in analyzing billing data lies in the fact that ICD/OPS codes are subject to continuous change. The codes for Lichtenstein procedures valid since 2016 (5–530.33 and 5–530.34) were included in the interrogation of the data (2009–2015), but did not yield any evaluation result (because—as Drs Nimptsch and Krautz commented—they were not yet firmly embedded in the OPS) and were therefore not included in the final data evaluation. In our published study (6), we considered minimally invasive inguinal herniotomy (laparoscopic transperitoneal closure [5–530.31] and endoscopic total extraperitoneal closure surgery [5–530.32]). Furthermore we checked the raw data and the published data once again in great detail and uncovered two errors: the codes for thyroidectomy (5–063) and 4/5 gastrectomy (5–436) are analyzed and included in the publication, but not reproduced in *eTable 1* (2). A relevant erratum was published. We thank your correspondents for their constructive criticism.

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