ORIGINAL ARTICLE

Can Quality of Care for Patients with Cirrhosis Be Measured?

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Abstract

Introduction The ultimate purpose of measuring quality of care is to discriminate between healthcare providers in order to motivate improvement. Recently, a set of evidence-based indicators has been proposed for measurement of processes of care for patients with cirrhosis, for example early endoscopy for variceal bleeding. The objective of this study was to determine whether these indicators can be measured in a reliable and automated fashion in routine practice.

Materials and methods We applied the top five indicators, based on agreement of a panel of experts, to hospitalized adults at our institution over a 3-year period.

Results Only two of the indicators could be reliably measured on the basis of the published wording, and these two still required physician chart review. After applying some assumptions, the indicators were met in 46–100% of cases. None of the indicators was linked to a single physician or institution in all cases, and none occurred with sufficient frequency to discriminate quality between providers.

Conclusion Measuring quality of care in cirrhosis is a laudable objective, but current indicators are not yet ready for administrative use.

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Abbreviations

SBP	Spontaneous bacterial peritonitis
PMN	Polymorphonuclear
UGIB	Upper gastrointestinal bleeding
EVL	Endoscopic variceal ligation
MAR	Medication administration record
EGD	Esophagogastroduodenoscopy
TIPS	Transjugular intrahepatic portosystemic shunt

Introduction

In complex chronic diseases, for example cirrhosis, physician compensation is all too often tied to the volume of services provided rather than the quality of those services [1]. This quality has been shown in numerous studies to be suboptimum compared with published guidelines. For example, in one study only 65% of providers recommended antibiotic prophylaxis for patients with prior spontaneous bacterial peritonitis (SBP) [2]. In another study, secondary prophylaxis of variceal bleeding was not performed for 35% of patients after an initial variceal bleed [3]. As few as 6–22% of patients with known grade II–III varices received primary prophylaxis with β-blockers [4, 5]. Rates of screening for hepatocellular carcinoma also seem to be very low, at 16–28% [6].

In response to this problem, Kanwal et al. recently assembled a multidisciplinary panel of 11 experts and used the RAND/UCLA appropriateness method to systematically identify a set of 41 quality indicators in six areas of care: ascites, variceal bleeding, hepatic encephalopathy,

hepatocellular cancer, liver transplantation, and general cirrhosis [7]. The quality indicators were constructed as "if–then" statements, where "if" characterizes the eligible patient population and "then" describes the care that should be given. Ideally this format would allow the quality indicators to be translated into a checklist so that quality of care can be systematically measured and eventually tied to reimbursement [8].

Although these quality indicators are an important step in defining quality of care for patients with cirrhosis, it is not yet known whether they will lead to useful measures of physician and/or health system performance. In order to function effectively, quality indicators must not only be medically justified, but also must:

1. be collectable using automated systems in order to reduce measurement burden;
2. have a clear denominator and denominator exclusions for the sake of consistency;
3. be linked to the actions of one provider or one institution; and
4. occur with sufficient frequency to produce reliable estimates [9].

The objective of this study was to determine whether quality indicators for cirrhosis meet these measurement criteria in a real-world practice.

Methods

We applied quality indicators to adults hospitalized at our institution with complications of cirrhosis between June 2006 and May 2009. Five indicators were chosen on the basis of having the highest level of agreement by the expert panel (from 72 to 100%), and are quoted verbatim as follows:

1. If hospitalized patients with ascites have an ascitic fluid polymorphonuclear (PMN) count of 250 cells/mm^3, then they should receive empiric antibiotics within 6 h of the test result.
2. If patients with cirrhosis present with upper gastrointestinal bleeding (UGIB), then they should receive upper endoscopy within 24 h of presentation.
3. If patients with cirrhosis are found to have bleeding esophageal varices, then they should receive endoscopic variceal ligation (EVL) or sclerotherapy at the time of index endoscopy.
4. If patients with cirrhosis survive an episode of acute variceal hemorrhage, then they should receive one of the following therapies to prevent recurrence of variceal hemorrhage: EVL every 1–2 weeks until obliteration, beta-blockers, or a combination.

5. If patients have clinically apparent (i.e., moderate to severe) ascites and normal renal function, then they should be managed with both salt restriction and diuretics (including a combination of spironolactone and loop diuretics).

For each of these indicators, we determined (when possible) our institution's performance. However, more importantly, we determined for each of these indicators whether the numerator and denominator could be measured using automated systems, we recorded any denominator exclusions, assessed the linkage between the indicator and a specific physician or institution, and calculated the frequency per physician and per institution each year. Finally, we reviewed each chart to investigate reasons why the quality indicators were not met.

Results

The proportions of cases meeting each of the five quality indicators are shown in Fig. 1, and described in detail below.

1. There were 44 cases of SBP identified, with empiric antibiotics given in 25 cases (56%) within 6 h of the test result. For this quality indicator, the numerator (antibiotic administration within 6 h) and denominator (>250 PMN/mm^3 in ascitic fluid) could be collected electronically on the basis of the laboratory computer system and the nursing medication administration record. However, denominator exclusions such as post-surgical fluid collections and malignant ascites required physician chart review. Documented reasons for late administration of antibiotics included a delay on the part of the provider from the time of paracentesis result (diagnosis of SBP) to the time antibiotic orders were written, and a delay obtaining and administering the ordered antibiotics. The provider component seemed to account for most of the delay, averaging 8 h 5 min from the time paracentesis results were available to the time the order for an antibiotic was written in cases where the quality indicator was not met. In those same cases the delay from the time the order was written to the time the antibiotic was administered was 3 h 59 min. In one case there was a delay of greater than 8 h attributed to a lack of intravenous access.
2. Upper GI bleeding in a patient with cirrhosis was more difficult to assess, because the appropriate denominator was not clear on the basis of the wording of the published quality indicator. Therefore, we specified that patients must present with

Fig. 1 Percentage achievement of quality indicator. *SBP* spontaneous bacterial peritonitis, *UGI* upper gastrointestinal
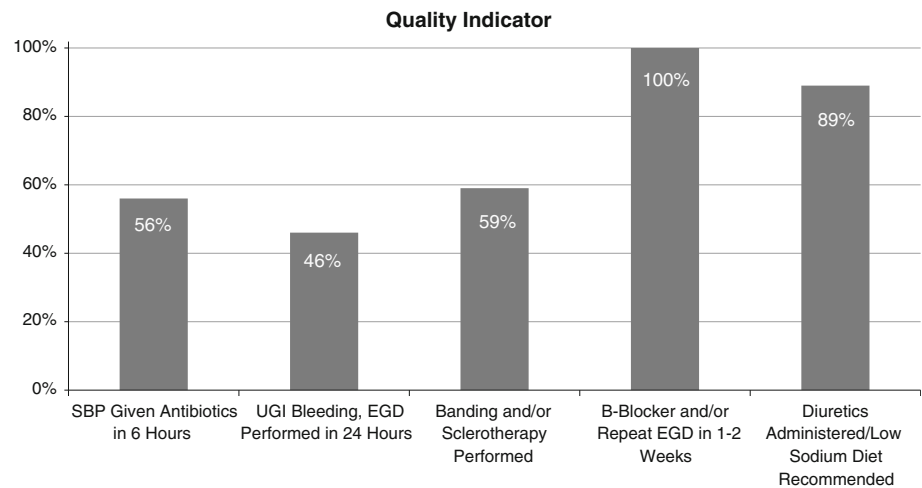
hematemesis or melena associated with tachycardia, hypotension, requirement for blood transfusion, or >2 g drop in hemoglobin. Using these criteria, we identified 76 cases of "clinically significant" UGIB in cirrhosis patients. Among these cases, upper endoscopy was performed at our institution within 24 h in 35 (46%) of cases. Of the cases in which early EGD was not performed at our institution, 11 of 41 (27%) had been performed within 30 days of presentation; nine of these were performed at an outside hospital before transfer. Because 29 patients had been transferred from another hospital, there was no direct link to one provider or institution in these cases. Of the 30 patients that did not have recent upper endoscopy and did not have upper endoscopy performed within 24 h of admission, documented reasons included sub-acute bleeding with low suspicion of variceal bleeding in 23 cases, and need for additional resuscitation for hemodynamic instability, severe anemia, and/or coagulopathy in seven cases.

3, 4. "Bleeding esophageal varices" were also difficult to assess because only two patients had active variceal bleeding at the time of endoscopy and 25 had an esophageal red wale or nipple sign. Among the 76 cirrhosis patients identified above with clinically significant UGIB, 67 were found to have esophageal varices on endoscopy; of these, banding or sclerotherapy was performed in 40 (59%). Five had stigmata of gastric variceal bleeding and would thus be an appropriate denominator exclusion from banding. In the remaining 22 with esophageal varices, the most common reason for lack of banding or sclerotherapy was identification of an alternative source of bleeding by the endoscopist. Specifically, in those 22 cases, there were five patients with gastric or duodenal ulcers, five patients

with portal hypertensive gastropathy, three patients with gastric antral vascular ectasia or arteriovenous malformations, one patient with esophageal ulceration, and one patient with antral erosions. In two cases banding was recently performed at an outside hospital and the repeat endoscopic examinations showed small esophageal varices with no active bleeding, which was cited as a reason not to perform further therapy on the esophageal varices. In one case banding was attempted but not successful. In the remaining patients, although there was no clearly identified alternative source of bleeding, no therapy of the esophageal varices was performed as they lacked red signs and were not believed to be a source of bleeding. In the subset of 40 patients in which endoscopic therapy was performed, 100% had repeat EGD performed within 1–2 weeks and/or beta-blocker administered.

5. Because the method for determining "clinically apparent (moderate to severe)" ascites had not been specified in the quality indicator, we chose to require that patients underwent diagnostic or therapeutic paracentesis while hospitalized. Using this metric, 259 cases of moderate to severe ascites were identified with the combination of loop diuretic and spironolactone prescribed in 195 (75%) on discharge. In the 64 cases in which loop diuretic and spironolactone were not prescribed, 40 had abnormal renal function (which we defined as creatinine >1.3 mg/dl). In one case amiloride was substituted for spironolactone. Therefore, our institution's performance for this indicator was 196/219 (89%). Of the 259 cases of moderate to severe ascites there were 227 (88%) in which the recommendation for salt restriction was documented either in daily progress notes or on the discharge summary. By using the requirement for paracentesis and the

creatinine threshold of 1.3 mg/dl, the denominator and most common denominator exclusion could be determined using automated systems. However, one part of the numerator (low salt diet) and other uncommon denominator exclusions (for example malignant ascites) still required chart review.

Discussion

Cirrhosis is a complex chronic disease that requires quality of care measurement to reduce practice variation and improve clinical outcomes. In this study, we applied the top five of a recently published set of quality indicators to patients hospitalized in our institution. We found that measuring all five indicators required physician chart review, and some of the indicators (#3, 4) could not be reliably measured. These findings suggest that while these indicators may be useful metrics for individual institutions to perform self-assessment and practice quality improvement, they are not yet ready for routine administrative use or linkage to reimbursement.

In addition to measurement problems and burden, these indicators are not always tied to a particular institution or providers, and occur with insufficient frequency to enable reliable estimation. Previous studies have shown that estimating performance requires at least 100 patients per individual physician in a given time period in order to obtain 80% reliability [10]. Given that our institution is relatively large (550 beds, with seven hepatologists) and still did not produce this number over a three-year period, we suggest that as performance metrics for cirrhosis improve, they will be most applicable at the institutional level.

Options for strengthening quality measurement could include wider use of the electronic medical record that would enable automated collection of quality indicators. We also believe that performance on quality indicators could be improved with modifications to our health care system which would emphasize collaboration between clinicians and across sites of care. Institutional procedures could be implemented that would focus on tasks such as vaccination and screening for hepatocellular cancer. Finally we believe we could increase compliance with some quality indicators (low sodium diet for example) by educating patients and recruiting the patient's network of family and friends to assist [1].

This study was not intended to be an exhaustive assessment of all 41 indicators, but rather as a case study of the logistical problems encountered when measuring quality of care for cirrhosis. Limitations of our study include its single-center nature. However, as a large academic institution with a computerized medical record and order entry system, this center may represent the "best case" scenario for quality measurement. Another limitation was the focus on hospitalized patients only. We speculate that including outpatients would cause even more measurement difficulties given shared care between multiple physicians at different institutions.

In conclusion, measuring quality of care in cirrhosis is a laudable goal, but further efforts are needed to develop quality indicators which can be measured in a reliable and automated fashion.

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