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Article type : Practice Guidance

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Development of Quality Measures in Cirrhosis by the Practice Metrics Committee of the American Association for the Study of Liver Diseases

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This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/HEP.30489

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Acknowledgment. The funding for the development of this document was provided by the American Association for the Study of Liver Diseases. The Expert Panel comprised Amit Singal, MD, Rony Ghaoui, M D, Hashem El-Serag, MD, John Vierling, MD, Bruce Runyon, MD, Arun Sanyal, MD, Scott Biggins, MD, Jasmohan Bajaj, MD, Timothy Morgan, MD, and Guadalupe Garcia-Tsao, MD.

This document was approved by the American Association for the Study of Liver Diseases on September 8, 2018.

ABSTRACT

Health care delivery is increasingly evaluated according to quality measures, yet such measures are underdeveloped for cirrhosis. The Practice Metrics Committee of the American Association for the Study of Liver Diseases was charged with developing explicit process- and outcome-based measures for adults with cirrhosis. We identified candidate measures from comprehensive reviews of the literature and input from expert clinicians and patient focus groups. We conducted an 11-member expert clinician panel and used a modified Delphi method to systematically identify a set of quality measures in cirrhosis. Among 119 candidate measures, 46 were identified as important measures to define quality of cirrhosis care, including 26 process measures, 7 clinical outcome measures, and 13 patient-reported outcome measures. The final process measures captured care processes across the entire spectrum from diagnosis, treatment, and prevention for ascites (5 measures), varices/bleeding (7 measures), hepatic encephalopathy (4 measures), hepatocellular cancer (HCC) screening (1 measure),

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liver transplantation evaluation (2 measures), and other care (7 measures). Clinical outcome measures included survival, variceal bleeding and re-bleeding, early-stage HCC, liver-related hospitalization, and rehospitalization within 7 and 30 days. Patient-reported outcome measures covered physical symptoms, physical function, mental health, general function, cognition, social life, and satisfaction with care. The final list of patient-reported outcomes was validated in 79 cirrhosis patients from 9 institutions in the United States.

Conclusion: We developed an explicit set of evidence-based quality measures for adult patients with cirrhosis. These measures are a tool for providers and institutions to evaluate their care quality, drive quality improvement, and deliver high-value cirrhosis care. The quality measures are intended to be applicable in any clinical care setting in which care for patients with cirrhosis is provided.

BACKGROUND

Cirrhosis is the final common pathway for all chronic liver diseases. Cirrhosis predisposes to a range of complications, including synthetic dysfunction, ascites, hepatic encephalopathy, variceal bleeding, and hepatocellular cancer (HCC). The prognosis of cirrhosis is highly variable. Patients with compensated disease may live with cirrhosis for a long time (median survival of 12 years[1]). However, survival in cirrhosis patients after hepatic decompensation or HCC is dismal (approximately 24 and 8 months,[2,3] respectively). Liver transplantation can be lifesaving in patients with cirrhosis; however, only a small minority undergo transplantation. Cirrhosis is also resource intensive. Most complications require hospitalization,[4] and nearly 70% of patients are readmitted within 1 year, costing >$20,000 per admission.[5] The burden of cirrhosis is amplified by its dramatic impact on quality of life resulting from multiple physical, psychological, cognitive, and social stressors.[6]

Many clinical practice guidelines that support evidence-based treatments for patients with cirrhosis exist.[7-13] Despite these treatments, there are substantial shortfalls in the quality of cirrhosis care,[14,15] suggesting a role for systematic quality improvement. Furthermore, the recent shift to value-based health care poses an urgent need to measure and improve the quality of cirrhosis care.[16] A major challenge in improving the

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value of cirrhosis care is the lack of standardized measures for tracking quality within and across health care settings.

To evaluate the quality of care, most quality improvement programs rely on multiple measures, including a combination of process and outcome measures.[17] A process-based measure evaluates the extent to which health professionals, institutions, or health plans provide or achieve the element of care included in the measure (eg, HCC screening, varices prophylaxis). Process measures have the advantage of requiring less risk adjustment because properly constructed specifications narrowly define the clinical circumstances for indicated care. Outcome-based measures require risk adjustment but define the most critical outcomes in health and health care (eg, physical function, hospitalization, survival). In this context, "risk adjustment" means adjusting for non-modifiable risk factors for poor outcomes.

Identifying and implementing a standard set of process- and outcome-based measures for cirrhosis is an essential step in promoting value improvement in cirrhosis care. An explicit set of process measures for cirrhosis care was developed over 10 years ago.[18] Although these measures have been used to evaluate quality of cirrhosis care in disparate health care settings,[14,15,19-21] they do not reflect recent advances in cirrhosis management. Furthermore, there has been limited effort in developing outcome measures for patients with cirrhosis. The lack of well-defined outcome measures is a main roadblock in implementing value-based programs in cirrhosis, where value is defined as achieving desired outcomes relative to the cost of care for patients with cirrhosis.

To fill these gaps, the American Association for the Study of Liver Diseases (AASLD) Practice Metrics Committee recently developed a standard set of quality measures, including process- and patient-centered outcomes for adults with cirrhosis. We aimed to select measures that, if implemented, would allow reliable and accurate measurement, tracking, and ultimately improvement of health care provided to patients with cirrhosis.

METHODS

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We used a predefined stepwise approach to identify the quality measures set as follows. A working group identified the candidate process and outcome measures based on a structured literature review and clinical experience. The working group then convened a separate 11-member expert panel that used 2-round modified Delphi method to identify the final measures set based on their importance, reach, and performance gap. These criteria were specified a priori and are described in detail in the section below. Patient focus groups and surveys were conducted to obtain patient input (Figure 1). We describe these steps in details below.

AASLD Practice Metrics Committee working group

The working group consisted of 10 AASLD Practice Metrics Committee members, including adult and pediatric hepatologists working in community and academic settings across the United States; several members also had specific expertise in health services research and epidemiology. The working group worked closely with 2 patient representatives (1 patient with decompensated liver disease and 1 caregiver) to ensure that outcomes perceived as important by patients were included in the candidate list.

Identification of the candidate measures set

The working group convened via conference calls between January and October 2017, with 1 face-to-face meeting in September 2017.

The working group defined the scope of the measures set to include all adult patients with cirrhosis regardless of the type and severity of complications, with few exceptions. The group purposely excluded processes and outcomes of care related to treatment of HCC because it is highly specialized and requires combined efforts from multiple disciplines. Moreover, the target population with HCC might be heterogeneous in terms of the severity of underlying liver disease, stage of tumor, and functional status to allow reliable quality measurement. Similarly, we excluded the processes and outcomes of care that occur immediately before or after transplantation (pre-transplantation evaluation, transplant procedure, post-transplant immunosuppressant use, etc.) because of the highly specialized nature of care.

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For process-based measures, the group started with a published process measures set.[18] The working group reviewed clinical practice guidelines published since development of the previous set to identify additional process measures to be included in the candidate measure list.

The group recognized that patient-centered outcome measurement in cirrhosis needs to encompass disease complications, hospitalization, and survival (clinical outcomes) as well as measures capturing patients' own assessment of their health status, including symptoms and physical, social, and mental functioning (patient-reported outcomes).[22] The working group performed a scoping review of literature to identify a comprehensive set of patient-reported outcomes for inclusion into the candidate measures. The results of this review are published elsewhere.[6] The working group then reviewed the list of candidate outcome measure and identified additional outcomes that captured the clinical status of patients with cirrhosis.

To ensure that we included patients' perspective in the outcomes identification, 2 separate focus groups of patients with cirrhosis and their caregivers were conducted in August 2017 (guided by MV). These included 7 patients on the liver transplant list and 7 caregivers. The discussion was guided by a semistructured format and continued until thematic saturation was reached.[23] Saturation is a widely accepted methodological principle in qualitative research. Thematic saturation occurs when new data (eg, comments, themes) become redundant with data already collected, indicating that further data collection is unlikely to yield additional information.

Modified 2-round Delphi process

We used a modified Delphi approach to identify a set of cirrhosis quality measures.[24] This is a formal group method in which an expert panel discusses and iteratively rates candidate quality measures by using a 2-round process. In the first round, the experts rate the proposed measures individually without any interaction among the members. In

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the second round—a face-to-face meeting—their preliminary ratings for the measures were discussed and then re-rated through an equally weighted voting.

Expert panel. A group of 11 hepatologists with content expertise participated in the modified Delphi process (see Acknowledgments section for names and affiliations of the panel members). We selected the panel members based on their recent publications and participation in the Advisory Councils for professional societies. The selection process was designed to maintain the geographic, clinical practice, and research interest diversity among the group.

Pre-meeting ratings (round 1). We instructed the panel to rate each measure on the following 3 criteria on a 9-point Likert scale: importance (primary criterion), reach, and performance gap. We defined a process measure to be "important" if (a) strong scientific evidence exists demonstrating that compliance with a given process of care improves health care outcomes, (b) the process being measured is closely connected to the outcome it impacts, and (c) the magnitude of effect of performing the measure is large enough that it is worth doing. We defined an outcome to be important if it (a) is important to patients or clinicians, (b) is meaningful across multiple populations, and (c) can help facilitate change and quality improvement. The importance scale ranged from 1 ("not important at all") to 9 ("extremely important") where 1-3 indicated "definitely not important," 4-6 indicated "uncertain or equivocal importance," and 7-9 indicated "definitely important." The "reach" of a measure was defined as the number of patients it applies to, where 1 indicated "smallest reach: applicable to few or no patients" and 9 indicated "largest reach: applicable to almost all patients." "Performance gap" was defined as the gap between current and desired performance on each process measure or gap between current and desired level for each outcome from 1 (no gap) to 9 (largest gap).

We determined the median panel rating and a measure of agreement for each measure for each criterion. Based on a priori considerations, we relied on ratings of importance as the primary criterion to guide measure selection process. Specifically, we selected measures if they were voted as definitely important (group median ≥7) with no extreme

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variation in expert ratings.[18,24] These selection criteria have been widely used to develop performance measures across several areas of medicine.[25-29] We defined no extreme variation when >80% of ratings were in the 7-9 range with none in the extreme 1-3 range.

Face-to-face meeting (round 2). The panel face-to-face meeting was moderated by FK and MV (nonvoting members). During this half-day meeting, each panelist received a table comparing their scores with the median scores (generated by other panelists) for each measure. Discussion focused on the areas of disagreement to understand the sources of variation. Panel members were also tasked with identifying additional measures not on the original list, modifying existing measures that were imperfectly worded, and deleting measures that were perceived to be problematic or irrelevant. After an updated list of measures was developed, the panelists re-rated the importance, reach, and performance gap of each measure again by using the 9-point scale. We selected measures based on ratings of importance. As above, we considered a measure important if the median rating was 7-9 without any disagreement between the raters. We presented median ratings on the remaining 2 constructs for the final measure set.

Validation of patient-reported outcomes

The final list of patient-reported outcomes was reviewed by 79 cirrhosis patients from hepatology clinics at 9 institutions in the United States. Participants were asked to complete an anonymous survey, rating the importance of each outcome on a 4-point scale (not important, somewhat important, very important, and extremely important) with an option to include additional outcomes in text form.

RESULTS

Candidate measures

The working group proposed 84 candidate measures, and the expert panel members recommended an additional 35 new measures. Among the set of 119 candidate measures, 63 were process-based and 56 were outcome-based. The process

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measures included care processes across the entire spectrum of care (diagnosis, treatment, and prevention) for ascites, varices, hepatic encephalopathy, HCC screening, liver transplantation evaluation, and general care. Of the 56 candidate outcome measures, 23 captured clinical (traditional) outcomes such as survival, hospitalization, and complications of cirrhosis. The remaining 33 were patient-reported outcome measures, covering 7 domains: physical symptoms, physical function, mental health, general function, cognition, social life, and satisfaction with care. See Supplementary Table 1 for the full list of candidate measures.

Measures selected based on modified Delphi process

Of the 119 candidate measures, 82 had a median rating of 7 or higher (Supplementary Table 1). Of these, we excluded 28 measures that met our definition of disagreement, as detailed above. Where appropriate, we combined selected measures based on content overlap to produce a final list of 46 measures. For example, experts rated use of intravenous albumin and use of antibiotics as important for patients with spontaneous bacterial peritonitis. We combined these 2 processes in 1 measure because both are recommended to be administered together in the management of spontaneous bacterial peritonitis. Similarly, we combined measures about diuretic use and dietary counseling regarding sodium intake in management of symptomatic ascites.

Table 1 includes the final process measures set with corresponding median ratings of importance, reach, and gap. Of the final set, 26 were process measures; 5 covered ascites care, 7 variceal bleeding-related care, 4 hepatic encephalopathy, 1 HCC screening, and 2 liver transplantation evaluation, and the remaining addressed general care of patients with cirrhosis. The final measure set also included 7 clinical and 13 patient-reported outcomes that were deemed important measures of quality of cirrhosis care by the expert panel (Table 2).

Validation of patient-reported outcomes

In total, 79 patients from 9 institutions completed a paper-based survey to rate the importance of patient-reported outcomes selected as part of the modified Delphi process above. Patients represented a broad spectrum of disease severity, including those with compensated and decompensated cirrhosis. Table 3 displays patient ranking

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of these outcome measures. Over 80% of patients rated all outcome measures as "somewhat" to "extremely" important except for the alcohol abstinence outcome, which had a marked bimodal distribution. Patient-reported outcomes that were deemed "very or extremely" important by 80% or more patients included reducing abdominal fluid accumulation (ascites), improving concentration and memory, and reducing medication side effects.

Measures by patient subgroups

We grouped the final measures based on the types of cirrhosis patients they apply to. Supplementary Table 2 displays the final set of measures applicable to most patients with cirrhosis as well as those applicable to specific subgroups of cirrhosis patients.

Measures applicable to most patients with cirrhosis. In total, 5 process, 2 clinical, and 8 patient-reported outcomes measures can be used to assess quality of care for most patients with cirrhosis, regardless of the specific clinical complication or stage of disease (Supplementary Table 2). The process measures include endoscopy for variceal screening, HCC screening, hepatitis B vaccination, frailty assessment, and management of patients with excessive alcohol use. Most of these measures were felt to have broad reach (median reach scores 8 to 9) with substantial gaps in current care (see Table 1).

Patient survival was felt to be the most important clinical outcome measure, followed by liver-related hospitalization. Patient-reported outcomes, each with broad reach and applicability (median reach score >7) included control of cirrhosis symptoms (pruritus, muscle cramps), falls, medication side effects, burden on caregivers, depression, stigma, and alcohol abstinence. Experts felt that there were moderate gaps between the current and ideal clinical and patient-reported outcomes.

Measures applicable to patients with ascites. There were 5 process measures and 2 patient-reported outcomes that were deemed important measures of quality of ascites care (Supplementary Table 2). The reach of specific measures ranged from 3 (applicable to few patients) for treatment of spontaneous bacterial peritonitis to 7

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(applicable to some but not all patients) for diagnostic paracentesis in hospitalized patients. The outcome measures included patient self-report of fluid accumulation (abdominal and overall). Experts felt that there were moderate gaps in the current and ideal clinical and patient-reported outcomes.

Measures applicable to patients with varices/variceal bleeding. In total, 7 processes and 2 clinical outcomes were considered important for measuring varices/variceal bleeding-related care. These included screening for varices, primary (and secondary) prophylaxis for variceal bleeding, and urgent endoscopy and appropriate therapy for patients with suspected acute variceal bleeding. Two clinical outcomes included first variceal bleeding and development of re-bleeding among patients with prior history of variceal bleeding. The reach of specific measures varied from 4 (for treatment of variceal bleeding) to 8 (for prevention of first episode of variceal bleeding). There were perceived moderate gaps in the current and ideal performance on process and clinical outcomes for variceal bleeding (see Table 1).

Measures applicable to patients with hepatic encephalopathy. There were 4 process measures and 3 patient-reported outcomes that were deemed important measures of quality of hepatic encephalopathy care (Supplementary Table 2). The process measures included counseling patients with prior overt hepatic encephalopathy about the risks associated with driving, searching for evidence of precipitating factors and treatment with lactulose in hospitalized patients with acute episodes of overt hepatic encephalopathy, and secondary prophylaxis with lactulose and/or rifaximin after resolution of acute episode. Patient-reported outcomes included self-reported episodes of confusion, impaired concentration and memory, and concern about inability to drive. The reach of process measures was felt to be low to moderate. In contrast, patient-reported outcomes were deemed applicable to a larger subgroup of patients with cirrhosis, with median reach scores in the 7 to 8 range (Table 1). Experts felt that there were moderate gaps in the current and ideal clinical and patient-reported outcomes for hepatic encephalopathy.

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Measures applicable to patients with HCC. The final set included 2 measures that can be used to assess quality of care for patients with HCC (Table 1). These included 1 process measure (consideration of liver transplantation for patients with HCC meeting transplant criteria) and 1 outcome measure (early-stage HCC at the time of diagnosis). Both measures had moderate reach with moderate gaps between current and ideal performance.

Other subgroups. Several measures were applicable to specific subgroups of cirrhosis patients, including patients who were hospitalized with cirrhosis (Supplementary Table 2). Table 1 displays the importance, reach, and gap scores for these measures.

DISCUSSION

We systematically developed a quality assessment tool that consists of 46 explicit measures, including both process measures as well as outcome measures relevant to the care of patients with cirrhosis. This effort is the first to identify an agreed upon set of outcome-based measures, including clinical and patient-reported outcomes in cirrhosis. Our development method, ie, the comprehensive literature review, the rigorous nature of the modified Delphi expert panel process, and extensive patient input, confers content validity on the selected measures.

We believe that the measures included in the cirrhosis set will provide a means of evaluating the quality of cirrhosis care in a reproducible manner across different practitioners, settings, and institutions. This comprehensive quality assessment tool spans the spectrum of disease severity and includes several process- and outcome-based measures for different cirrhosis complications, thereby allowing reliable assessment of quality of cirrhosis care. We also present data on potential reach of the measures as well as perceived gaps in the current quality. Collectively, this information can guide practitioners in selecting a subset that best fits their clinical context and quality improvement targets. For example, practices serving compensated patients with cirrhosis, including primary care providers, may select measures that are applicable to

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most patients with cirrhosis, such as HCC screening, peripheral edema, and survival. In contrast, liver specialty clinics that primarily focus on patients with decompensated cirrhosis may select complication-specific measures (eg, ascites, hepatic encephalopathy, and varices-specific measures). Thus, although the full set (Tables 1 and 2) provides health care professionals and institutions with a comprehensive quality assessment tool, we anticipate that individuals and institutions may select the measures that best fit their clinical context and quality goals.

We recognize that a major barrier to implementing measures in clinical practice is the challenge of collecting data to successfully track and record performance. Successful implementation of these measures will require adaptations in technical infrastructure to allow data collection. Major electronic medical record vendors are creating structured data fields within specialty-specific templates that can allow collection of structured data for consistent and reliable quality assessments. Similarly, several tools exist that support collection and integration of patient-reported data into electronic health records. Future research is needed to determine whether patient surveys can be included and/or imported seamlessly into the electronic charts as discrete fields for easy abstraction. We recognize that, in addition to significant modifications in technical infrastructure, successful implementation of the standard set will require a significant change in clinical attitudes and workflow. Our near-term goal is to implement selected measures as part of the Cirrhosis Quality Collaborative initiative. In this step, we will include specification of case-mix factors as well as exclusion criteria for all measures to adjust for differences between theoretical guidelines and real care practice and to set benchmark performance in cirrhosis. In addition to improving the accuracy of measure, accounting for patient exclusion criteria and case-mix will allow comparisons across health care facilities with different patient populations. We will also develop procedures for implementation and sustainability of data collection—information that will pave the way for broader dissemination and adoption.

We focused on measures that are intended for quality improvement efforts. We believe that it would be premature to use the measures set to benchmark provider performance

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without further research. Specifically, implementation of these measures for accountability, in contrast with quality improvement efforts, will require further testing to address a variety of issues pertaining to the identification of a subset that not only is important but also meets the criteria for necessary care (ie, the expected benefits not only outweigh the expected harms, but they do so by such a margin that the provider must offer the service); other issues include methods of data collection, frequency of implementation, comparability among practices, audit requirements, the system of public reporting, and more importantly, the input from stakeholder groups, including third-party payers and policy makers. Future work of the Practice Metrics Committee will evaluate whether some of the measures in the cirrhosis set can be applied for tracking quality for purposes of accountability in cirrhosis.

Though we are confident that we captured critical processes and outcomes, we also recognize that our measurement set does not encompass all measures that may matter to patients with cirrhosis. Several measures were underrepresented because of limitations related to the quality and quantity of data supporting the measures. For example, although screening for minimal hepatic encephalopathy may be important, available tests lack specificity for the condition.[30] Several measures were not included in the candidate list due to difficulty in defining the target condition (such as refractory ascites, refractory variceal bleeding, and stage III/IV hepatic encephalopathy) using readily available data. These conditions would require manual chart reviews to define and might not be feasible in quality improvement efforts that require repeated assessments.[31] Some measures (such as screening for harmful alcohol use and clinical depression) were not specifically addressed because these measures are applicable to all patients seeking health care and are already included in several quality-reporting and payment programs sponsored by commercial payers and government agencies (eg, Medicare's quality reporting Merit-based Incentive Payment System).

In summary, we have developed an explicit set of 46 evidence-based measures relevant to several aspects of care in adults with cirrhosis. The measures may provide health care professionals and institutions with a tool to identify processes amenable to

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quality improvement interventions. The outcome measures included in the final set will be important as we adapt to evolving health care delivery models that attempt to optimize quality of care. The measures are intended to be applicable in different health care settings in which care for patients with cirrhosis is provided.

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Figure 1 Legend

Steps in the development of cirrhosis quality measures set. We identified candidate measures from published set of process measures, a scoping review of the literature, and input from expert clinicians as well as patient focus groups. Using the modified Delphi method, an expert panel of clinicians voted on the candidate measures to systematically identify a set of quality measures in cirrhosis. The final list of patient-reported outcomes was reviewed and endorsed by cirrhosis patients from 9 institutions.

	Table 1. Process Measures	**Median**		
	Process Measures	**Importance**	**Reach**	**Gap**
1	Patients with ascites who are admitted to the hospital for evaluation and management of symptoms related to ascites or encephalopathy should receive a diagnostic paracentesis during the index hospitalization	9	7	6
2	Patients who are admitted with or develop GI bleeding should receive antibiotics within 24 hours of admission or presentation. Antibiotics should be continued for at least 5 days	9	4	5
3	Patients undergoing large-volume paracentesis (>5 liters removed) should receive intravenous albumin (6-8 grams per liter removed)	8	3	5

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4	Hospitalized patients with ascites, with an ascitic fluid polymorphonuclear count of ≥250 cells/mm^3, should receive empiric antibiotics and albumin within 12 hours of the test result. The first dose of albumin should be 1.5 g per kg body weight followed by a second infusion of 1.0 g/kg on day 3.	8	3	6
5	Patients with ascites and/or hepatic hydrothorax should be managed with both sodium restriction and diuretics.	8	3	4
6	Patients who undergo paracentesis should not receive fresh frozen plasma or platelets	8	5	7
7	Patients with cirrhosis, with platelet count <150,000/mm^3 or liver stiffness measurement >20 kPa, and no documentation of previous GI bleeding, should receive upper endoscopy to screen for varices within 12 months of cirrhosis diagnosis	8	6	5
8	Patients with decompensated cirrhosis and no documented history of previous GI bleeding should receive upper endoscopy to screen for varices within 3 months of cirrhosis diagnosis	8	4	5
9	Patients with cirrhosis, no documented history of previous GI bleeding, and medium/large varices on endoscopy should receive either nonselective β-blockers or EVL within 1 month of varices diagnosis.	8	5	4
10	Patients with cirrhosis who present with upper GI bleeding should receive upper endoscopy within 12 hours of presentation	9	5	5
11	Patients with cirrhosis who are found to have bleeding esophageal varices should receive EVL or sclerotherapy at the time of index endoscopy	9	4	2
12	Patients with cirrhosis who survive an episode of acute variceal hemorrhage should receive a combination of EVL and β-blockers.	8	4	5
13	Patients with prior overt hepatic encephalopathy should be counseled regarding the risks associated with driving.	8	4	7
14	Patients with hepatic encephalopathy should have a search for evidence of precipitating factors documented in the chart.	8	4	6
15	Patients who are hospitalized and have an acute episode of overt hepatic encephalopathy should receive lactulose.	8	4	4
16	Patients who are discharged after an acute episode of hepatic encephalopathy should receive secondary prophylaxis with lactulose	8	5	6.5

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	and/or rifaximin			
17	Patients with cirrhosis and MELD score ≥15 who do not have absolute contraindications to liver transplantation should have documentation of evaluation for liver transplantation.	8	5	7
18	Patients with cirrhosis who do not have absolute contraindications to liver transplantation and have HCC meeting the transplant criteria should be considered for liver transplantation, irrespective of their MELD score.	8	5	7
19	Patients with cirrhosis should undergo HCC screening using abdominal imaging with or without serum α-fetoprotein every 6-12 months	9	8	8
20	Patients with cirrhosis should have hepatitis B immune status and/or vaccination documented in the chart.	8	9	6
21	Patients with untreated hepatitis C cirrhosis should be considered for antiviral therapy for hepatitis C	9	6	5
22	Patients with untreated hepatitis B cirrhosis should be considered for antiviral therapy for hepatitis B	9	4	5
23	Patients with cirrhosis should receive counseling or be referred to a substance abuse treatment program within 2 months of positive screening.	9	8	6
24	Patients with cirrhosis who are undergoing abdominal surgery should have documentation of the risk–benefit of undergoing the surgical procedure in the medical record	8	7	7
25	Recently discharged patients with cirrhosis should have a clinic visit with a health care provider within 4 weeks of discharge.	8	5	7
26	Patients with cirrhosis should be assessed for frailty using a systematic screening method	8	7	7.5

1 Abbreviations: EVL, endoscopic variceal ligation; GI, gastrointestinal; HCC, hepatocellular carcinoma;
2 MELD, Model for End-Stage Liver Disease.
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Table 2. Outcome Measures				
Clinical Outcomes		**Importance**	**Reach**	**Gap**
1	Patient survival	9	9	5

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2	First variceal bleeding	8	8	6
3	Variceal re-bleeding among patients with history of variceal bleeding	8	4	5
4	Patients diagnosed at an early stage among patients with HCC	8	7	6
5	Liver-related hospitalization	8	8	6
6	Rehospitalization within 7 days	8	5	6
7	Rehospitalization within 30 days	8	6	6
Patient-Reported Outcomes				
8	Fluid in the legs (edema)	7	6	5
9	Fluid in the belly (ascites)	8	4	6
10	Confusion	8	8	6
11	Concentration and memory	8	7	6
12	Itching	8	3	6
13	Muscle cramps	7.5	6	5
14	Falls	7	6	5
15	Medication side effects	7	7	5
16	Depression	8	7	8
17	Stigma of having liver disease	7	7	6
18	Ability to drive	8	6	7
19	Burden on family	8	7	7
20	Be able to avoid alcohol	8	6	6

1 Abbreviation: HCC, hepatocellular carcinoma.

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Table 3. Patient Ratings of Patient-Reported Outcomes (%)			
Patient-Reported Item	**Not Important**	**Somewhat Important**	**Very/Extremely Important**
Fluid in the legs (edema)	8.9%	14.1%	76.9%
Fluid in the belly (ascites)	3.8%	5.1%	91.1%
Confusion (encephalopathy)	1.3%	10.1%	88.6%
Concentration/memory	6.4%	16.7%	76.9%
Itching (pruritus)	5.2%	12.9%	81.8%
Muscle cramps	12.9%	36.4%	50.7%
Falls	12.8%	17.9%	69.2%
Medication side effects	8.9%	17.9%	73.1%
Depression	7.6%	21.7%	70.5%
Stigma of having liver disease	5.1%	14.1%	80.8%
Ability to drive	10.1%	22.8%	67.1%
Burden on family	35.1%	5.2%	59.8%
Ability to avoid alcohol	17.1%	18.4%	64.4%

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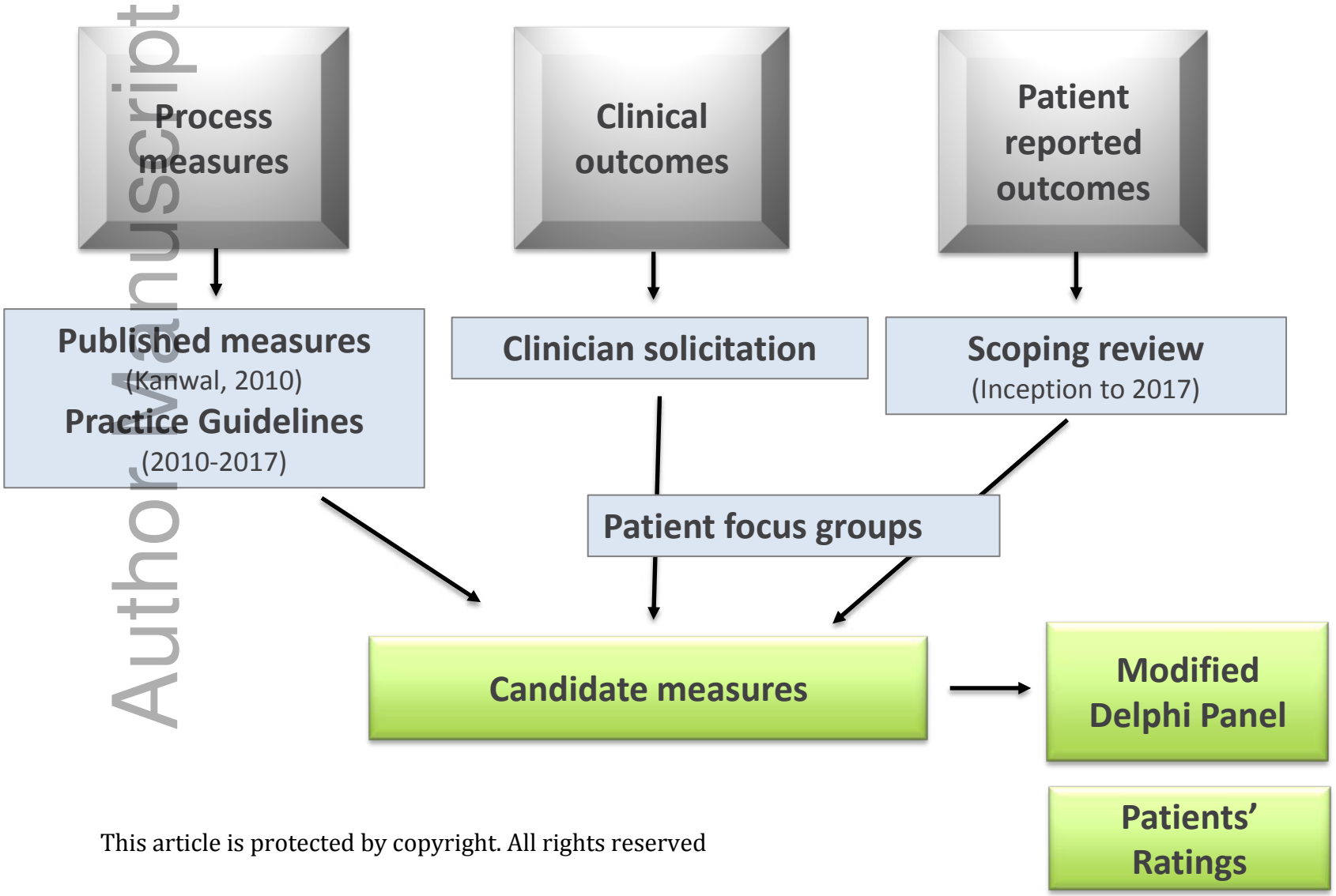
Figure 1. Steps in the development of cirrhosis quality measures set



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