Research Article

EASL EUROPEAN ASSOCIATION FOR THE STUDY OF THE LIVER | JOURNAL OF HEPATOLOGY

How to improve care in outpatients with cirrhosis and ascites: A new model of care coordination by consultant hepatologists

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Background & Aims: The development of ascites in patients with cirrhosis is associated with a high rate of health care utilization. New models of specialized caregiving support are necessary to optimize its management. The aim of the study was to evaluate the efficacy and financial sustainability of the "Care management check-up" as a new model of specialized caregiving support based on a series of diagnostic facilities performed in real time and on the integrated activity of consultant hepatologists at the hospital unit for outpatients, dedicated nurses, physicians in training and primary physicians, compared to standard care in outpatients with cirrhosis and ascites.

Methods: 100 cirrhotic patients admitted to our hospital were allocated, after discharge, to the "Care management check-up" group (group 1), or to the "Standard outpatient care" group (group 2), and followed prospectively as outpatients up to death or for at least 12 months. Patients of the two groups could also access to a "Day hospital" when an invasive procedure was required. In group 1, the "Care management check-up" and the "Day hospital" taken together defined the "Care management program".

Results: Twelve-month mortality was higher in group 2 than in group 1 (45.7% *vs.* 23.1%, p <0.025). The rate of 30-day readmission was also higher in group 2 (42.4% *vs.* 15.4%, p <0.01). The global cost attributable to the management per patient-month of life was lower (1479.19 ± 2184.43 €) in group 1 than (2816.13 ± 3893.03 €) in group 2 (p <0.05).

Conclusions: The study suggests that this new model of specialized caregiving reduces 12-month mortality in patients with cirrhosis and ascites as well as the global health care costs for their management.

Keywords: Day hospital; Care management program; Health care costs; Health care system; Hospital readmission; Mortality; Quality of assistance.

Received 26 November 2012; received in revised form 6 March 2013; accepted 12 March 2013; available online 21 March 2013

☆ DOI of original articles: http://dx.doi.org/10.1016/j.jhep.2013.04.021, http://dx.doi.org/10.1016/j.jhep.2013.05.013.

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Abbreviations: MELD, Model for End Stage Liver Disease; CTP, Child-Turcotte-Pugh; HCC, hepatocellular carcinoma; SOFA, sequential organ failure assessment; HE, hepatic encephalopathy; LT, liver transplantation; €, euro.

Introduction

Ascites is the most common complication of cirrhosis and its appearance is associated with a very high risk of developing other complications such as bacterial infections, renal failure, hyponatremia, hepatic encephalopathy, and gastrointestinal bleeding. Therefore, the development of ascites is associated with a poor quality of life and a poor long-term survival [1–3].

As a consequence, these patients have high rates of disability, health care utilization, and a need for informal caregiving [4]. Recently, it has been observed that 69% of patients with decompensated cirrhosis had had at least one non-elective readmission, with a median time to the first readmission of 67 days [5]. Thus, new models of specialized caregiving are necessary to optimize the management of this frail population [4]. To date, no single new idea has been proposed for the patient with cirrhosis and ascites, and, on a more general level, with only few exceptions, the problem still remains open for several other chronic diseases.

The effectiveness of the intervention by the specialist physician in managing ambulatory patients with chronic diseases is not as firmly established as that of patients hospitalized for acute illnesses. Diabetes mellitus can be taken as an example: although several studies have reported that specialists are more likely to carry out recommended tests or to increase hypoglycemic treatment, only one found significant benefits from specialist care compared with primary care physicians, after adjustment for case-mix and selection bias [6]. Likewise, a recent metanalysis evaluated 22 studies by comparing specialized treatment versus traditional outpatient care for patients affected by chronic disease such as rheumatoid arthritis, diabetes mellitus, and cystic

fibrosis. In this work, no significant differences have been found in the outcomes between patients followed in the two different modalities of assistance [7]. Beyond the specific limits of the individual studies, it is likely that some limitations of the intervention of a specialist in managing chronic diseases in outpatients are structural. This means that they are not related to the role of the specialist physician in itself, but rather to the caregiving model adopted by the physician. More precisely, it can be hypothesized that the intervention of a specialist physician may have a much better chance of success if it proves (a) to be programmed on the severity of the disease, (b) to be performed on the basis of clinical-instrumental evaluations performed in real time, and (c) to be strongly integrated with the activity of the primary care physicians.

For these reasons, a new model of specialized caregiving for outpatients with cirrhosis and ascites namely the "Care management check-up" was designed. Its basis was (a) the integrated activity of a team at the hospital unit for outpatients which includes consultant hepatologists, dedicated nurses and physicians in training; (b) the possibility of evaluating the patients on the basis of all the required laboratory parameters and instrumental procedures performed in real time, and (c) the ability to share the assessment of the whole management of the patients with the general practitioner, including planning for its further development. In addition, a "Day hospital", based on the same assumptions and facilities, was reserved to patients requiring invasive procedures such as paracentesis and/or banding ligation of esophageal varices and/or blood transfusions. The "Care management check-up" together with the "Day hospital" defined, in our view, the "Care management program" for outpatients with cirrhosis and ascites.

Thus, the aim of the study was to assess the efficacy and financial sustainability of this new model of specialized caregiving in outpatients with cirrhosis and ascites compared to the "Standard outpatient care", i.e., family doctor control and management plus punctual consultation to a hospital specialist.

Patients and methods

Patients

The study was conducted in consecutive patients with cirrhosis and ascites discharged from the General Hospital of Padova between January 1st and June 30th, 2011. All patients had been admitted through the Emergency Department of the Hospital for an acute complication of cirrhosis (causes of admission are reported in Supplementary Fig. 1). Patients were confirmed to have cirrhosis by clinical, laboratory, and imaging data. The presence of ascites was confirmed by abdomen ultrasound examination and/or paracentesis, either diagnostic or therapeutic. Exclusion criteria were the following: (a) age <18 or >80 years; (b) admission for scheduled diagnostic or therapeutic procedures; (c) decompensation following liver resection; (d) hepatocellular carcinoma (HCC) outside the Milan criteria [8]; (e) chronic severe extrahepatic disease; (f) HIV infection. The flow chart of the study is shown in Fig. 1. One hundred and ten patients discharged from the Hospital were consecutively and alternately allocated to the "Care management check-up" group (group 1), or to the "Standard outpatient care" group (group 2) with a 2:3 ratio, and were followed up to death or for at least 12 months. The 2:3 ratio was established "*a priori*" to make it possible to perform a subanalysis of patients assigned to the "Standard outpatient care". The only allocation criterium was the chronological order of discharge from the hospital. The patients in the two groups were individually matched for eight variables: age, gender, type of ascites (responsive *vs.* refractory or recurrent), Model for End Stage Liver Disease (MELD) score, Child-Turcotte-Pugh (CTP) score, etiology of cirrhosis, local or not local residence, and co-morbidities. The eight variables were chosen because of their potential effect on all the provided outcomes. In particular, the potential confounding effect of co-morbidities was avoided by matching the patients for the chronic disease score based on diagnosis, namely the Charlson index, which was adjusted for patients with chronic liver disease [9]. Refractory ascites was defined by lack of response to low sodium diet and spironolactone 400 mg/day plus furosemide 160 mg/day or appearance of diuretic-induced complications [2,3], while recurrent ascites was defined on the basis of at least 1 paracentesis during the preceding three months prior to inclusion in the study. The study was approved by the ethical Committee of the University and General Hospital of Padova (registration number = 2222P on 13/12/2010) as part of a larger study that aimed at defining the natural history of patients who were hospitalized for complications of cirrhosis. Written informed consent was obtained from each patient.

Study design

Demographic and clinical data, vital signs, and laboratory data panel, including blood cell count, AST, ALT, GGT, ALP, liver tests, renal tests, serum electrolytes were recorded at the time of inclusion in the study. MELD score, CTP score and the presence of hepatic and/or extrahepatic organ failure, which was identified using a sequential organ failure assessment (SOFA) score [10], were calculated at the time of inclusion.

The "Care management check-up" group (group 1)

All patients admitted to the "Care management check-up" group were followed by a team comprised of consultant hepatologists, dedicated nurses, and physicians in training at the hospital unit for outpatients. Vital signs and laboratory data panel were recorded on all scheduled data. A hepatic ultrasound examination was repeated on the same day in all patients who had not undergone it during the previous six or three months, due to the risk of development of HCC or portal vein thrombosis. An upper endoscopy was repeated on the same day in all patients without any evidence of varices on previous examination and who had not undergone it during the previous two years. In all patients with a CTP score $\geqslant 9$ a possible minimal HE was identified by psychometric tests and EEG. In patients with alcohol-related liver cirrhosis, the detection of alcohol consumption was done using the Alcohol Use Disorders Identification Test, by measuring serum and urinary levels of ethanol, urinary ethyl glucuronide, and carbohydrate-deficient transferrin on all scheduled data. On a typical check-up day the patient spent a minimum of five hours to a maximum of nine hours in the Hospital Unit.

On acquiring all the results of laboratory tests and instrumental procedures mentioned above, dietary (i.e., restriction of sodium and/or water, specific dietetic measures for HE) and pharmacological treatments (i.e., changes in the dose of diuretics for the control of ascites and/or of disaccharides for the treatment and/or prevention of HE, propranolol for the prevention of gastrointestinal bleeding, nucleoside/nucleotide analogues for the control of the recurrence of HBV-infection, norfloxacin for the prophylaxis of spontaneous bacterial peritonitis) were updated according to the EASL, AASLD, and Baveno guidelines [2,3,11–13]. In patients with HCC, the need for a new staging and/or a new treatment was also accounted for and programmed. In all patients with a MELD score $\geqslant 15$ and in those with HCC without potential contraindication for liver transplantation (LT), the selection program to LT was started and scheduled. Finally, the date of the subsequent check-up was set from one week to three months later, according to the degree of severity and/or grade of instability of the liver disease. All these decisions were fully communicated to the primary physician in real time. One patient in this group was lost to follow-up.

The "Standard outpatient care" group (group 2)

In this group of patients, after hospital discharge, the responsibility for the management in keeping with existing guidelines was entrusted to the primary physician with the support of a specialist physician who checked them with follow-up visits "*on demand*" and/or without the availability of data from laboratory examinations and instrumental procedures in real time. This type of outpatient specialized caregiving represents the standard specialized care of outpatients with cirrhosis and ascites in our country. One patient in this group was lost to follow-up.

Other forms of specialized caregiving in the two groups

"Day hospital" was reserved to all outpatients of both groups who required invasive procedures such as paracentesis and/or banding ligation of esophageal varices and/or blood transfusions. In all patients admitted for clinical data, vital signs, and laboratory data panel were recorded on the scheduled day. Each patient in group 1 was followed during the "Day hospital" by the same team responsible for the "Care man-