



Effectiveness of patient-oriented education and medication management intervention in people with decompensated cirrhosis

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Abstract

People with chronic disease often have poor comprehension of their disease and medications, which can negatively affect health outcomes. In a randomised-controlled trial, we found that patients with decompensated cirrhosis who received a pharmacist-led, patient-oriented education and medication management intervention ($n = 57$) had greater knowledge of cirrhosis and key self-care tasks compared with usual care ($n = 59$). Intervention patients also experienced improved quality of life. Dedicated resources are needed to support implementation of evidence-based measures at local centres to improve outcomes.

Effective chronic disease management requires patients and their caregivers to have the necessary knowledge and skills to engage in self-care tasks, self-monitor for evolving complications, adhere to clinician recommendations and cultivate positive health behaviours. However, many patients have poor comprehension of chronic disease, mismanage their medications and fail to adopt important lifestyle modifications.

In 2017, we published a brief communication article¹ that encouraged research at a local level to identify the educational needs and preferences of patients under the care of local healthcare centres to develop appropriate chronic disease education strategies. As an example of chronic disease in a local setting, we described poor patient knowledge of disease, medications, self-monitoring, and

dietary and lifestyle modifications among 50 Australians with liver cirrhosis, consistent with findings from an American study.² Our pilot study data subsequently informed the development of a patient-oriented education and medication management intervention, targeted to people with decompensated cirrhosis. The intervention was driven by a clinical pharmacist and implemented as a randomised-controlled trial in a multidisciplinary hepatology outpatient centre.

The study protocol has been published.³ In brief, eligible adults with a history of decompensated cirrhosis were invited to participate when they attended for routine outpatient follow up at one of seven concurrent general hepatology clinics. Consenting patients were randomised to receive the education intervention or usual care. Usual care participants received routine review and education from their hepatologist according to the standard model of care in the clinic throughout the study period. Intervention participants received up to four additional contacts (at t_0 , t_1 , t_2 and t_3) over a 6- to 8-month period from a trained clinical pharmacist in person or via telehealth, in addition to usual care. During these contacts, patients received medication and disease education according to the study protocol in addition to reactive advice tailored to patients' individual needs.

Abbreviations: Brief-IPQ, Brief-Illness Perception Questionnaire; CLDQ, Chronic Liver Disease Questionnaire; IQR, interquartile range; QoL, quality of life.

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All patients completed a survey at baseline (t_0) and follow up (t_3) that contained measures for study end-points, including self-reported medication adherence (Morisky Medication Adherence Scale),^{4–6} medication and illness beliefs (Beliefs about Medicines Questionnaires⁷ and Brief-Illness Perception Questionnaire (Brief-IPQ)⁸), health-related quality of life (QoL) (Chronic Liver Disease Questionnaire (CLDQ),⁹ modified to exclude question 29 as previously described¹⁰) and knowledge of cirrhosis self-management tasks (eight ‘knowledge’ questions adapted from Volk *et al.*² by a clinician panel (KH, EP, JM, PV and LH)). Surveys were completed independently by the patient or with the aid of a study coordinator or caregiver/family member according to individual need and preference to reflect a real-world scenario. Hot deck imputation was utilised as per the study protocol³ to assign missing responses to individual questionnaire items, but not entirely missing questionnaire tools (knowledge questions were not imputed). Data from 12 patients (10.3%) included imputation (median (interquartile range, IQR): 2.0 (1.0–3.5) imputed values out of a total 124 items across all baseline and follow-up questionnaires). A sensitivity analysis was conducted to evaluate the choice made with regard to handling missing data (with and without imputation). There was no difference in tested values in terms of variation above or below the significance threshold ($\alpha = 0.050$).

The study was approved by the Human Research Ethics Committees at The University of Queensland (UQ201600032) and the Metro South Hospital and Health Service (HREC/15/QPAH/688), and informed written consent was obtained from all participants. The trial was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12616000780459).

One hundred and sixteen patients were randomised (59 to receive usual care and 57 to receive the intervention). Baseline characteristics of participants have been published.¹¹ Although liver disease severity (Model for End-Stage Liver Disease and Child-Pugh score) was not significantly different between groups, intervention patients were taking more medications (median (IQR): 10.0 (6.5–12.0) vs 8.0 (6.0–9.5); Mann–Whitney U -test $P = 0.006$) and had a lower self-reported level of education (proportion educated to middle school or below: 53.1% vs 32.7%; Pearson’s χ^2 $P = 0.036$).

Despite more patients having lower education levels (educated to middle school level or below), we found that intervention patients answered a greater number of ‘knowledge’ questions correctly at follow up than usual care patients ($P = 0.009$; Table 1). Specifically, intervention patients had greater awareness of the importance of maintaining a low-salt diet ($P = 0.002$) and safe over-the-counter analgesia ($P < 0.001$). Among 33

intervention and 32 usual care patients who answered all eight questions at baseline and follow up, the overall count of correct responses improved among the intervention group (median (IQR): 5.0 (4.0–6.0) to 6.0 (4.0–6.5); Wilcoxon signed-rank test $P = 0.027$), but not the usual care group (median (IQR): 4.0 (3.0–5.0) to 4.0 (4.0–6.0); Wilcoxon signed-rank test $P = 0.243$). This is consistent with other studies that found low health literacy does not prevent patients from benefiting from education interventions.^{12,13}

Intervention patients also reported greater self-perceived understanding (Brief-IPQ *coherence*) of liver disease at follow up compared with usual care ($P = 0.004$; Table 2). This is an important finding as lower *coherence* has previously been associated with ‘low’ medication adherence in people with decompensated cirrhosis.¹⁰ Medication beliefs have also been associated with ‘low’ adherence;¹⁰ however, medication beliefs and adherence were not modified by our study intervention (Supporting Information Tables S1 and S2 respectively). The lack of change in patients’ medication beliefs in the current study was unsurprising, as *necessity* beliefs among intervention patients at baseline were comparable with what could be considered an ‘adherent’ population in other studies.¹⁴ The prevalence of ‘low’ adherence in our study cohort at baseline was also lower than previously reported in Australians with cirrhosis.^{15,16} Therefore, there was limited room for improvement.

Compared to usual care, participants who received the intervention reported a greater perception of symptoms (Brief-IPQ *identity*; $P = 0.003$) and impact of liver disease on daily life (Brief-IPQ *consequences*; $P = 0.005$), which coincided with a reduction in median scores for these items among the usual care group (Table 2). This finding conflicted with responses to the QoL questionnaire (Table S3), which identified no difference between groups in terms of *abdominal symptoms, activity, emotion, fatigue, systemic symptoms or worry*. In fact, among the 38 intervention and 41 usual care patients with CLDQ questionnaire responses at baseline and follow up, those in the intervention group had a significant improvement in self-reported QoL (median (IQR) global CLDQ score: 3.9 (3.3–5.1) to 4.3 (3.2–5.4); Wilcoxon signed-rank test $P = 0.044$), whereas usual care patients did not (median (IQR) global CLDQ score: 4.0 (3.3–5.1) to 4.1 (3.1–5.6); Wilcoxon signed-rank test $P = 0.226$). It therefore seems unlikely that intervention patients would experience greater *consequences* of disease on daily life and more symptoms (*identity*), as suggested by the results of the Brief-IPQ. Rather, in the context of a significantly greater Brief-IPQ *coherence* score, it could be suggested that intervention participants are better able to identify that the symptoms and impacts on daily life they are

Table 1 Patient responses to knowledge and self-care questions at baseline and follow up

Questions	Baseline (t_0)			Follow up (t_3)		
	Usual care ($n = 52$)	Intervention ($n = 48$)	P	Usual care ($n = 40$)	Intervention ($n = 36$)	P
For people with cirrhosis who have minor aches and pains, (what is) the safest over-the-counter medication?†	27 (61.4%)	35 (79.5%)	0.062	22 (55.0%)	35 (97.2%)	<0.001
• Paracetamol						
If people with cirrhosis get swelling in the belly, legs or feet, should they cut down on drinking fluids to help with this problem?	12 (23.1%)	15 (31.2%)	0.358	18 (45.0%)	20 (55.6%)	0.358
• No‡						
If the sodium level in your blood is low, does this mean you need to eat more salt?	26 (50.0%)	30 (62.5%)	0.208	23 (57.5%)	32 (88.9%)	0.002
• No						
How often do you keep to the 'low salt diet' restriction? (self-report)	37 (71.2%)	37 (77.1%)	0.499	28 (70.0%)	30 (83.3%)	0.172
• All/most of the time						
How often do you eat out or get take away food? (self-report)	32 (61.5%)	32 (66.7%)	0.594	23 (57.5%)	22 (61.1%)	0.749
• Fortnightly or less often						
How frequently do you check your blood pressure? (self-report)	27 (51.9%)	27 (56.2%)	0.664	22 (55.0%)	17 (47.2%)	0.498
• At least once a month						
How frequently do you weigh yourself? (self-report)	25 (48.1%)	26 (54.2%)	0.543	22 (55.0%)	21 (58.3%)	0.770
• Daily/weekly						
Do you regularly bring your medications/list to your medical appointments? (self-report)	29 (55.8%)	26 (54.2%)	0.872	22 (55.0%)	22 (61.1%)	0.590
• Yes						
Total score†	4.0 (3.0–5.0)	5.0 (4.0–6.0)	0.065	4.0 (4.0–6.0)	6.0 (4.0–6.5)	0.009
1 point for each correct response						

Categorical data presented as count (%) and analysed using Pearson's χ^2 test. Total score presented as median (IQR) and analysed using the Mann–Whitney U -test. † $n = 44$ usual care and $n = 44$ intervention patients at t_0 , and $n = 40$ usual care and $n = 36$ intervention patients at t_3 . ‡Except those prescribed a fluid restriction.

Table 2 Perceptions of illness among intervention and usual care participants at baseline and follow up

Brief-IPQ items	Baseline (t_0)			Follow up (t_3)		
	Usual care ($n = 53$)	Intervention ($n = 52$)	P	Usual care ($n = 43$)	Intervention ($n = 39$)	P
Consequences	6.0 (4.0–8.0)	7.0 (5.0–9.0)	0.239	5.0 (3.0–7.0)	8.0 (5.0–10.0)	0.005
Timeline	10.0 (6.0–10.0)	9.0 (5.0–10.0)	0.485	10.0 (5.0–10.0)	10.0 (8.5–10.0)	0.148
Personal control	5.0 (3.0–7.0)	5.0 (3.0–7.0)	0.874	5.0 (3.5–8.0)	6.0 (2.5–7.0)	0.443
Treatment control	8.0 (7.0–10.0)	8.0 (8.0–10.0)	0.593	8.0 (5.0–9.5)	9.0 (7.0–10.0)	0.108
Identity	5.0 (3.0–7.0)	7.0 (5.0–8.0)	0.057	4.0 (1.0–7.0)	6.0 (4.5–8.0)	0.003
Concern	8.0 (5.0–10.0)	9.0 (7.0–10.0)	0.034	7.0 (3.5–9.0)	8.0 (6.0–10.0)	0.106
Coherence	8.0 (5.0–9.0)	8.0 (6.0–9.5)	0.579	8.0 (5.5–9.0)	9.0 (7.5–10.0)	0.004
Emotional representation	5.0 (2.0–7.0)	5.5 (3.0–8.5)	0.075	5.0 (1.0–7.0)	6.0 (3.5–8.0)	0.286

Data presented as median (IQR) and analysed using the Mann–Whitney U -test.

experiencing are directly or indirectly related to liver disease. Conversely, usual care patients, who report experiencing a similar frequency of *abdominal activity*, *emotion*, *fatigue*, *systemic symptoms* and *worry* to intervention patients, may attribute their symptoms to another cause. As patients with decompensated cirrhosis who are ineligible

for transplant are currently incurable, improvement in self-reported QoL is a significant outcome, as this is often a key goal of treatment in end-stage or palliative diseases. As the global CLDQ score for non-cirrhotic patients with chronic liver disease is approximately 5.1, and those with Child-Pugh A and Child-Pugh B/C cirrhosis report average scores

of 4.5 and 3.8, respectively, the observed improvement of 0.4 among the intervention group may also be clinically meaningful.⁹

Discussion

To our knowledge, this is the first randomised-controlled trial of a pharmacist-led education and medication management intervention in people with decompensated cirrhosis. Previous studies of simple education interventions and one chronic disease case-management intervention have demonstrated mixed results for improving endpoints in people with cirrhosis.^{1,2,17} Our multifaceted intervention – which was informed by our pilot study to target the educational needs of local patients with cirrhosis and delivered in a patient-oriented modality to suit preferences and level of engagement – supports our hypothesis that implementation of local initiatives is important to improve patients' knowledge of chronic disease and improve health outcomes.

As a single-centre local study, we acknowledge the fact that our findings have inherent bias. Results from a multivariable analysis are likely to be less biased than results emanating from a series of univariable analyses; however, our study was not powered for this. We evaluated the impact of a single clinical pharmacist at one of the largest tertiary hepatology outpatient centres in Queensland, Australia. Participants were heterogeneous in terms of disease aetiology, severity and multimorbidity, which are consistent with the ambulatory population of patients managed by our centre. Due to the nature of the intervention, information provided to patients and their caregivers was staggered and tailored according to clinical relevance. Intensity of care from treating clinicians and

nurses was similarly tailored, and patients may have been reviewed by medical staff with different levels of experience (consultant physician, basic physician trainee or advanced gastroenterology trainee).

Our study is one example of a successful local measure that was implemented with mindful study design to target deficits in patient knowledge that we identified at our own centre. These findings have substantial implications for evolving ambulatory patient management, as opportunity to empower patients in their own healthcare becomes paramount in an increasingly overburdened healthcare system. Dedicated resources are needed to support implementation of evidence-based measures at local centres to improve outcomes.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's web-site:

Table S1. General and specific medication beliefs reported by usual care and intervention participants at baseline and follow up.


Table S2. Patient responses to the self-reported medication adherence questionnaire at baseline and follow up.

Table S3. Health-related quality of life reported by intervention and usual care participants at baseline and follow up.

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PERSONAL VIEWPOINT

Impact of COVID-19 on an Australian intensive care unit: lessons learned from South Australia

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Key words

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Abstract

The scale of the COVID-19 pandemic represents unprecedented challenges to healthcare systems. We describe a cohort of 18 critically ill COVID-19 patients – to our knowledge the highest number, in a single intensive care unit in Australia. We discuss the complex challenges and dynamic solutions that concern an intensive care unit pandemic response. Acting as the State's COVID-19 referral hospital, we provide local insights to consider alongside national guidelines.

The scale of the COVID-19 pandemic represents an unprecedented challenge to healthcare systems worldwide. On 16 March 2020, South Australia officially declared a Public Health Emergency, and the Royal Adelaide Hospital (RAH) – an 800-bed quaternary referral

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