






## Review

# Palliative long-term abdominal drains for the management of refractory ascites due to cirrhosis: a consensus document

Lucia Macken,<sup>1</sup> Margaret Corrigan,<sup>2</sup> Wendy Prentice,<sup>3</sup> Fiona Finlay ,<sup>4</sup> Joanne McDonagh,<sup>5</sup> Neil Rajoriya ,<sup>5</sup> Claire Salmon,<sup>6</sup> Mhairi Donnelly ,<sup>7</sup> Catherine Evans,<sup>8</sup> Bhaskar Ganai,<sup>1</sup> Joan Bedlington,<sup>9</sup> Shani Steer,<sup>10</sup> Mark Wright ,<sup>11</sup> Ben Hudson,<sup>12</sup> Sumita Verma ,<sup>1,13</sup> on behalf of the British Association for the Study of the Liver/British Society of Gastroenterology (BASL/BSG) End of Life Special Interest Group

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For numbered affiliations see end of article.

## Correspondence to

Professor Sumita Verma, Clinical and Experimental Medicine, Brighton and Sussex Medical School, Brighton, East Sussex, UK; [s.verma@bsms.ac.uk](mailto:s.verma@bsms.ac.uk)

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## ABSTRACT

Palliative care remains suboptimal in advanced cirrhosis, in part relating to a lack of evidence-based interventions. Ascites remains the most common cirrhosis complication resulting in hospitalisation. Many patients with refractory ascites are not candidates for liver transplantation or transjugular intrahepatic portosystemic shunt, and therefore, require recurrent palliative large volume paracentesis in hospital. We review the available evidence on use of palliative long-term abdominal drains in cirrhosis. Pending results of a national trial (REDUCe 2) and consistent with recently published national and American guidance, long-term abdominal drains cannot be regarded as standard of care in advanced cirrhosis. They should instead be considered only on a case-by-case basis, pending definitive evidence. This manuscript provides consensus to help standardise use of long-term abdominal drains in cirrhosis including patient selection and community management. Our ultimate aim remains to improve palliative care for this under researched and vulnerable cohort.

## Key points

- ⇒ Nationally, cirrhosis-related mortality has increased significantly over the last four decades.
- ⇒ Ascites is the most common cirrhosis complication. Despite many patients with refractory ascites due to cirrhosis not being liver transplant candidates, palliative interventions remains a clear unmet need.
- ⇒ Palliative long-term abdominal drains (LTADs) are routinely used in refractory malignant ascites but are not standard of care in cirrhosis, pending results of a national definitive trial.
- ⇒ Currently, outside of a research setting, LTADs should only be considered in cirrhosis on a case by case basis after careful patient selection.
- ⇒ Patients being considered for LTADs should be referred to palliative care services.
- ⇒ The key to successful implementation of LTAD in cirrhosis will be integrated working between the hospital and community teams.

## INTRODUCTION

Liver disease-related deaths in England have increased by >250% since 1971.<sup>1</sup> Nationally, the COVID-19 pandemic has resulted in a 20% increase in all cause alcohol-related deaths in 2020 compared with 2019.<sup>2</sup>

The current manuscript focuses on palliative management of refractory ascites

due to decompensated cirrhosis (henceforth referred as advanced cirrhosis), with emphasis on long-term abdominal drains (LTADs). After the recent feasibility study,<sup>3,4</sup> funding has just been obtained for a definitive randomised controlled trial (REDUCe 2) comparing large volume paracentesis (LVP) vs palliative LTADs in refractory ascites due to cirrhosis (Health



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Technology Assessment (HTA) project: National Institute for Health and Care Research (NIHR 133889). This intervention is also undergoing National Institute for Health and Care Excellence (NICE) assessment (GID-IPG10194). Therefore, at present, LTAD cannot be regarded as standard of care in advanced cirrhosis. However, following on from the feasibility study and recently published case series/systematic review,<sup>4-6</sup> use of LTADs has increased nationally, but without oversight. To help standardise LTAD usage and improve practice, we provide guidance on patient selection and community management, based on the current best current available evidence.<sup>4-6</sup>

The guidance was developed through the consensus of an expert panel, who were invited on behalf of the British Association for the Study of the Liver/British Society of Gastroenterology (BASL/BSG) End of Life Special Interest Group. This included specialists in hepatology and liver transplantation, palliative medicine, community and liver nursing, interventional radiology (IR) and patient groups. The quality (level) of the evidence and the strength of each guidance statement are not formally rated, owing to a current paucity of high-quality data in this area.

## REFRACTORY ASCITES DUE TO ADVANCED CIRRHOSIS

Ascites remains the most common cirrhosis complication requiring hospitalisation,<sup>7,8</sup> up to a third of patients progressing to refractory ascites.<sup>9,10</sup> The International Ascites Club Criteria defines refractory ascites as either (1) diuretic-resistant ascites or (2) diuretic-intractable ascites.<sup>11,12</sup> Once refractory ascites develops, transplant-free survival is 6–12 months.<sup>9,10,13,14</sup> However, patients with refractory ascites are a heterogeneous group, older age (>60 years), presence of hepatocellular cancer and diabetes mellitus predicting poorer survival, while alcohol abstinence is independently associated with improved survival.<sup>13</sup>

Many patients with refractory ascites are not candidates for transplantation (9–10, 13–14), transjugular intrahepatic portosystemic shunt (TIPS) or the Automated Low Flow Ascites pump.<sup>15,16</sup> Data from one UK secondary liver centre showed that from 2013 to 2015, only 14% of patients with refractory ascites were listed/underwent liver transplantation and/or TIPS,<sup>10</sup> consistent with studies from Europe and America.<sup>9,13,14</sup> LVP remains the most common palliative intervention for refractory ascites. An English mortality study noted that of the 44 923 patients who died from liver disease in England between 2013 and 2015, 13 181 (29%) required LVP in their last year of life, mean annual cost/person being >£21 000.<sup>17</sup>

In a recent systematic review pain and breathlessness, commonly observed with ascites, were reported by up to 88% of patients with cirrhosis.<sup>18</sup> Unsurprisingly, health-related quality of life (HRQoL) is more significantly impaired in patients with cirrhosis than

in both healthy controls and those with non-cirrhotic chronic liver disease, the impairment increasing with worsening cirrhosis severity.<sup>18-22</sup> Ascites is one of the main drivers of impaired HRQoL in advanced cirrhosis, both in patients and caregivers.<sup>21,23-27</sup>

## REFRACTORY ASCITES AND PALLIATIVE CARE

Despite refractory ascites being a reliable prognostic guide, only a minority of patients with advanced cirrhosis are referred to palliative care, often in the last few days before death.<sup>10,28-31</sup> Timely palliative care in cirrhosis can improve symptom control,<sup>32,33</sup> address goals of care/advance care planning<sup>34,35</sup> and reduce hospitalisations.<sup>4,29,36</sup> Approximately 75% of patients with advanced cirrhosis die in hospital,<sup>17,37</sup> compared with 40% with advanced cancer.<sup>38</sup> Lack of evidence-based guidelines remains an obstacle to optimal palliative care in advanced cirrhosis.

## EVIDENCE FOR PALLIATIVE INTERVENTIONS FOR REFRACTORY ASCITES DUE TO ADVANCED CIRRHOSIS REMAINS A CLEAR UNMET NEED

In ascites due to advanced abdominal malignancy there is evidence to support the use of palliative LTADs.<sup>39-42</sup> These tunnelled drains are inserted in hospital under local anaesthetic into the peritoneal cavity. Community nurses or informal caregivers (if willing), then drain small amounts (1–2 L) of ascitic fluid in the community, up to three times a week. LTADs could reduce hospitalisation, improve symptom control and HRQoL and be cost-effective to the National Health Service.<sup>39-42</sup> Currently LTADs are not standard of care in advanced cirrhosis, ongoing concerns being community management and the increased peritonitis<sup>16</sup> risk in cirrhosis. These concerns were evident in our national survey of BSG and BASL members.<sup>43</sup>

## LTAD USE IN ADVANCED CIRRHOSIS

An earlier systematic review assessed LTADs in refractory ascites due to advanced cirrhosis,<sup>6</sup> though most studies were rated as ‘poor’ (Newcastle-Ottawa Scale).<sup>44</sup> Nonetheless, LTAD insertion success was 100%, no further ascites-related hospitalisations needed in 14/18 studies where data were provided. Peritonitis rates (12.7%) were however more than two fold higher than reported in malignant ascites (median 5.9%, range 2.5%–34%).<sup>6,39</sup>

Recent data come from the feasibility REpeated Drainage in Untreatable Cirrhosis (REDUCe) trial,<sup>3,4</sup> comparing palliative LTADs vs LVP in refractory ascites due to advanced cirrhosis. Thirty-six patients were randomised with 21 (58%) completing the 3-month study, both groups receiving prophylactic antibiotics for the study duration. LTAD insertion was successful in all participants, only 2/15 (13%) requiring further hospitalisations specifically for ascites. Peritonitis incidence (LTAD vs LVP) was 6% vs 11%, self-limiting cellulitis (treated if needed with antibiotics, none

requiring hospitalisation), being 41% vs 11%, respectively. Median fortnightly total costs were about 15% lower in the LTAD group. Symptom and HRQoL scores were highly variable in both groups, likely reflecting the small sample size.<sup>4</sup> An embedded qualitative study indicated LTAD acceptability by patients and nurses.<sup>45</sup> The REDUCe study demonstrated feasibility with preliminary evidence of LTAD effectiveness, safety, acceptability and reduced health resource utilisation supporting a future definitive trial.

## **GUIDANCE FOR THE MANAGEMENT OF PATIENTS REQUIRING LTADS**

### **1. Selection of patients for LTAD insertion**

1.1 LTADs can be considered on a case-by-case basis in patients with refractory ascites who are not under consideration for/listed for liver transplantation or TIPS.

1.2 The decision for LTAD insertion should be made by a multidisciplinary team.

1.3 LTADs may be less appropriate in patients if there is a reasonable prospect of recompensation (eg, alcohol-related liver disease with subsequent abstinence).

1.4 LTAD insertion is not appropriate for patients with chylous or loculated ascites.

1.5 LTAD may not be appropriate for patients who are likely to be in their last days/weeks of life.

1.6 Hepatic encephalopathy and paucity of caregiver support should not be considered absolute contraindications to LTAD insertion.

1.7 Appropriate community nursing support should be available in the specific region.

Consistent with recently published national and American guidance,<sup>16 46</sup> LTADs cannot be regarded as standard of care in advanced cirrhosis, pending results of the definitive trial. The decision for LTAD insertion should therefore be made on a case-by-case basis at a multidisciplinary meeting where suitability for transplantation or TIPS should also be discussed. While some non-UK centres are inserting LTADs in potential transplant candidates,<sup>47</sup> pending definitive evidence, our current recommendation is that LTADs not to be inserted in patients who are under

consideration, or listed for liver transplantation and or TIPS. This is because of risk of potential infection and/or sclerosing peritonitis increasing surgical risk. Rarely, patients initially deemed unsuitable for transplantation may become eligible (eg, with improved nutritional status). In such instances, however, the presence of an LTAD should not be an absolute contraindication for transplantation.

Once deemed to have true refractory ascites<sup>11 12</sup> and TIPS/transplant ineligibility, an LTAD could be considered a potential option. **Table 1** shows the indications and contraindications for LTADs. LTADs may be more suitable than repeated LVPs when recompensation is less likely (eg, non-alcoholic fatty liver disease). In particular, the propensity to recompensate in alcohol-related liver disease (on alcohol cessation) and chronic viral hepatitis (after antiviral treatment) should be considered prior to LTAD insertion (although LTAD insertion can still be considered in these aetiologies).

Not all patients with refractory ascites due to cirrhosis would find an LTAD acceptable. Those who are socially isolated, hospital-based LVP maybe their only opportunity for social interaction. LTAD insertion may also not be appropriate in most patients likely to be in the last few days/weeks of life, as the benefits of short-term LTAD insertion are unlikely to be greater than an isolated LVP procedure. Presence of hepatic encephalopathy and absence of caregivers should not be considered absolute contraindications to LTAD insertion. However, practicalities of use and care in these patients groups needs careful consideration and planning. As patients with advanced cirrhosis can deteriorate suddenly, pragmatic, individualised decision making is often the best way forward.

### **2. Provision of palliative care and advance care planning**

2.1 Patients with refractory ascites should be counselled around their prognosis.

2.2 Patients undergoing LTAD insertion and their caregivers should be aware that it is a procedure carried out with palliative intent.

2.3 All patients in whom LTAD insertion is considered should be afforded an opportunity to engage

**Table 1** Indications and contraindications for long-term abdominal drains (LTADs) in refractory ascites due to cirrhosis

<b>Indications for LTAD</b>	<b>Contraindications for LTAD</b>	
	<b>Absolute</b>	<b>Relative</b>
Refractory ascites defined as per International Ascites Club criteria with need for repeated large volume paracentesis		
Not eligible for TIPS±liver transplant	Loculated/chylous ascites	Stage 4 CKD (eGFR <30 mL/min)
	Candidate for liver transplant/TIPS	Prior life-threatening SBP
	Actively dying, that is, expected die within days	Active infection
		Reasonable possibility of recompensation
CKD, chronic kidney disease; SBP, spontaneous bacterial peritonitis; TIPS, transjugular intrahepatic portosystemic shunt.		

in advance care planning, and should have access to specialist palliative care services if and when required.

We recommend that palliative care and advance care planning discussions are initiated in parallel with consideration of LTAD insertion. These discussions should focus on the goals and priorities of the individual to help guide treatment decisions (eg, is there a desire to be managed at home if possible, attitudes to LTAD). It should encompass discussions around prognosis (and prognostic uncertainty), and advance care planning. Some patients and caregivers may find it difficult to accept that refractory ascites, like advanced cancer, is a life-limiting condition. This is consistent with REDUCe study qualitative data where in some instances LTADs were misinterpreted as active treatment rather than a palliative intervention.<sup>45</sup>

### 3. Periprocedural management of LTAD insertion

3.1 Patients undergoing LTAD insertion should be counselled regarding risks and alternatives of the procedure, and ideally provided with written material prior to the procedure.

3.2 Clotting parameters (INR and platelets) should be checked within 7 days of LTAD insertion, and corrected as per IR protocols.

3.3 Patients should have a diagnostic ascitic tap within 7 days of LTAD insertion to exclude spontaneous bacterial peritonitis (ascitic neutrophil count  $<250$  cells/mm<sup>3</sup>/white cell count  $<500$  cells/mm<sup>3</sup> and negative ascitic fluid culture). Patients in whom spontaneous bacterial peritonitis is diagnosed should be fully treated prior to LTAD insertion.

3.4 Patients undergoing LTAD insertion should be offered ongoing prophylactic antibiotics to reduce peritonitis risk (as per local trust protocol).

There are currently two LTADs available in the UK: PleurX, recently rebranded as PeriX (UK Medical, Basingstoke, UK) and Rocket (Rocket Medical plc, Watford, UK). These devices have a CE mark for intermittent, long-term drainage of symptomatic, recurrent, malignant and non-malignant ascites. In absence of head-to-head trials comparing the devices, the choice of LTAD remains at clinician's discretion.

Box 1 shows the recommended checklist prior to LTAD insertion and figure 1 shows important facets of informed consent. It must be emphasised to patients and caregivers that this is a palliative intervention with a limited evidence base in cirrhosis. Unlike LVP where routine testing of INR and platelet is not recommended,<sup>16 48</sup> insertion of LTAD is more invasive as it involves tunnelling. Therefore haemostatic function should be checked within 7 days of LTAD insertion and necessary products administered if INR  $\geq 1.5$  and or platelet count  $\leq 50 \times 10^9$ /L (box 1). This would be standard practice for most interventional radiologists.<sup>49</sup>

There are no evidence-based guidelines on use of prophylactic antibiotics in setting of LTADs. NICE, European and BSG guidelines<sup>16 48 50</sup> recommend

#### Box 1 Checklist prior to long-term abdominal drain insertion

- ⇒ Not a transjugular intrahepatic portosystemic shunt/liver transplant candidate
- ⇒ Absence of loculated/chylous ascites.
- ⇒ Clear discussions with patients and caregivers that LTAD is a palliative intervention, current evidence being from a small trial and case series.
- ⇒ Community nursing team able to support such patients.
- ⇒ Referral made to hospital and community palliative care team.
- ⇒ Schedule appointment for LTAD insertion with interventional radiology/clinician.
- ⇒ Check INR and platelet count up to 7 days prior to LTAD insertion. If INR is  $\geq 1.5$  and platelet count  $\leq 50 \times 10^9$ /L consider blood products.
- ⇒ Perform a diagnostic ascitic tap for cell count and culture up to 7 days prior to LTAD insertion.
- ⇒ Antibiotic prophylaxis (as per local trust guidelines) for duration that LTAD remains in situ.
- ⇒ Discuss with caregivers if they are willing to help with home drainage.
- ⇒ Inform community nursing team and ensure that they are provided with a contact number for the parent medical team.
- ⇒ Inform LTAD manufacturer so that additional bespoke training can be organised for patients and caregivers if needed.
- ⇒ General practitioner notification letter including details of required prescription for ongoing drainage bag supply.
- ⇒ If the LTAD is being inserted outside of a research setting, ensure clinical outcomes audited and reviewed.

prophylactic antibiotics if total ascitic fluid protein is  $<15$  g/L. However, recent studies suggest that ascitic fluid protein may not predict peritonitis risk.<sup>51 52</sup> As already stated, peritonitis risk is more than twofold higher when LTADs are inserted in patients with cirrhosis compared with those with malignant ascites.<sup>6 39</sup> We would therefore recommend that all patients be offered prophylactic antibiotics (as per local protocols), as long as the LTAD remains in situ, especially if planned duration is for 3 months or longer.<sup>53</sup> Since this is a palliative cohort, the duration of antibiotic usage will in most patients be short-term in-keeping with overall life expectancy. Risk/benefits of prophylactic antibiotics should however be discussed with patients and their caregivers.

#### 4. Practicalities of LTAD insertion (box 1 and table 2)

4.1 LTADs can be inserted by any appropriately trained clinician

4.2 LTADs should be inserted under ultrasound guidance

4.3 Ascites should be drained to dryness (with human albumin solution as required) at the time of LTAD insertion

The decision to offer LTAD should ideally be undertaken by an MDT. This should be documented in the patient case notes along with why the patient is not suitable for TIPS/transplantation.

The patient and/or caregiver should be appropriately counselled by the hepatologist or experienced CNS with documented discussion of the wider aspects of the planned procedure including alternatives and delayed risks. It must be emphasised that this is a palliative intervention

A formal written consent form should be completed by the practitioner who is inserting the LTAD, usually an interventional radiologist

<b>Counselling:</b>
Intended benefits <ul style="list-style-type: none"> <li>To treat ascites for relief of symptoms including abdominal swelling and discomfort, nausea and anorexia, shortness of breath and decreased mobility</li> <li>Avoiding the need to attend hospital for recurrent paracentesis</li> <li>Due to smaller volumes of fluid being drained, potentially reduced risk of hypotension, renal dysfunction and electrolyte imbalance</li> </ul>
Alternatives including LVP and ALFA pump (if locally available)
Brief description of insertion procedure and what will happen on the day.
Opportunity for patient/caregiver to have a look at the LTAD and understand what the external drain will look like
Acknowledgement that use of LTADs in non-malignant ascites is not currently standard of care nor approved by NICE (pending further evidence from a national trial)
Overview of procedural risks <p>Common</p> <ul style="list-style-type: none"> <li>Minor bleeding and transient leakage</li> <li>Pain/discomfort</li> <li>Need for pre-procedure blood product transfusion</li> </ul> <p>Uncommon</p> <ul style="list-style-type: none"> <li>Failure of insertion</li> <li>Infection</li> <li>Persistent fluid leakage</li> </ul> <p>Rare</p> <ul style="list-style-type: none"> <li>Severe bleeding</li> <li>Reaction to local anaesthetic</li> <li>Abdominal organ perforation</li> <li>Death</li> </ul>
How LTAD will be managed in community – caregiver vs. nurses
Long term complications (see Table 4 for more details and comparisons to LVP) <ul style="list-style-type: none"> <li>Skin infection (cellulitis) and need for oral antibiotics</li> <li>Leakage around site</li> <li>Peritonitis and need for hospital admission for intravenous antibiotics +/- LTAD removal</li> <li>Drain displacement</li> <li>Dehydration, hypotension, electrolyte imbalance</li> </ul>
Discussion that in most cases routine blood monitoring (renal and electrolytes) will not continue

**Figure 1** Considerations when counselling a patient/caregiver for insertion of a long-term abdominal drain. ALFA, automated low flow ascites; CNS, clinical nurse specialist; INR, international normalised ratio; LTAD long-term abdominal drain; LVP, large volume paracentesis; MDT, multidisciplinary team; NICE, National Institute for Health and Care Excellence; TIPS, transjugular intrahepatic portosystemic shunt.

LTAD insertion is done as a day case with ultrasound guidance, the technique having been previously described.<sup>3</sup> While at most sites, LTAD insertion will be performed by IR, this is not essential. Individuals inserting drains outside of IR should undergo a period of supervised practice in IR, and be assessed as competent to perform the procedure independently. Once an LTAD has been inserted it is recommended that the ascites is drained to dryness with HAS (20%) administered as per LVP protocol.<sup>16 48</sup> This makes subsequent community management of ascites easier. On discharge, incontinence sheets should be provided as some leakage is to be expected along with approximately 2 weeks supply of drainage bags with discharge

notification being sent to the general practitioner (GP) to organise ongoing supply. Patients are advised to keep the wound sites dressed until the community nurses remove the stitches.

### 5. Community management of LTADs

5.1 Community teams should be informed of the decision to proceed with LTAD insertion in advance, and have access to support and advice in secondary care when required (see online supplemental file 1 for community standard operating procedure).

5.2 Patients should have approximately 2–3 drainage procedures/week with up to 2 L of ascites being removed on each occasion, with a maximum 5 L of

**Table 2** Do's and don'ts when inserting long-term abdominal drains (LTADs) for refractory ascites

Do's	Don'ts
Emphasise that this is a palliative intervention, the evidence being limited to a small trial and case series	Do not do routine blood tests and ascitic fluid analysis in asymptomatic patients following LTAD insertion
Ensure that patients have been referred to palliative care.	Do not routinely administer human albumin solution as an outpatient
Check haemostatic function and screen for peritonitis prior to LTAD insertion.	Do not assume that LTAD will be suitable for every patient with refractory ascites.
Provide a contact number for the hospital parent medical team.	
Work closely with community nursing teams.	
Ensure good nutritional intake.	
Encourage caregivers to participate in home drainage.	

ascites drained/week. This will be sufficient for most patients.

5.3 Caregivers can be trained in LTAD drainage when appropriate/willing.

5.4 Patients undergoing community drainage of ascites do not require human albumin solution replacement.

Multidisciplinary working between hepatology, community, primary and specialist palliative care, and family caregivers is essential to the successful management of a patient with an LTAD. This is a complex patient group with multiple distressing symptoms increasing as end of life approaches. The management of the LTAD is a component of community nursing care that should be incorporated into the provision of end of life care for this patient group. Following LTAD insertion, the patient's GP and the community nursing team should be informed to ensure continuity of care between hospital and community. Most community nursing teams are familiar with LTAD as they are used in malignant ascites, however, experience in advanced cirrhosis is very limited. Based on REDUCe study data,<sup>4</sup> we would recommend two to three nursing visits per week with 1–2 L being drained at each visit with initially a maximum of 5 L being drained each week (see online supplemental file 1) for community standard operating procedure). This will be sufficient for most patients.

A small proportion of patients (13% in the REDUCe study),<sup>4</sup> who remain symptomatic from ascites despite drainage of 5 L/week in the community should undergo supplementary LVP in hospital (via the LTAD using drain specific adaptors), with HAS replacement as per LVP protocol.<sup>16 48</sup> In this small subset of patients who require LVPs in hospital despite 5 L/week community drainage, higher volume community LTAD drainage

can be considered on a case-by-case basis, in discussion with the consultant/community teams. Community nurses should be provided with a named contact from the hospital hepatology team to address queries for care provision in the community. This allows management of increasing symptom distress as disease progresses, facilitates individualised care and supports the community teams thus reducing unplanned hospital visits. Family caregivers if available and able to be involved with drainage can be supported to do so by the community nurses and hospital team.

Use of long-term outpatient HAS remains contentious. Two recent studies gave conflicting results, those with advanced ascites less likely to benefit.<sup>54 55</sup> LTAD is a palliative intervention, focus being on symptom control, improving HRQoL and moving care to the community. Currently, therefore, outpatient HAS cannot be routinely recommended in this cohort. In the REDUCe study, there was a decrease in week 2 serum albumin (g/L) (median, IQR) compared with baseline in the LTAD group as regular HAS was not administered: 29.5 (27.5–31.5) vs 33.<sup>33–36</sup> However, serum albumin levels then remained stable until end of study.<sup>4</sup> Week 12 serum albumin and serum creatinine were similar in both LTAD and LVP groups.<sup>4</sup> Figure 2 summarises the process for LTAD selection and management and table 2 lists the do's and don'ts.

## 6. Potential complications following LTAD insertion

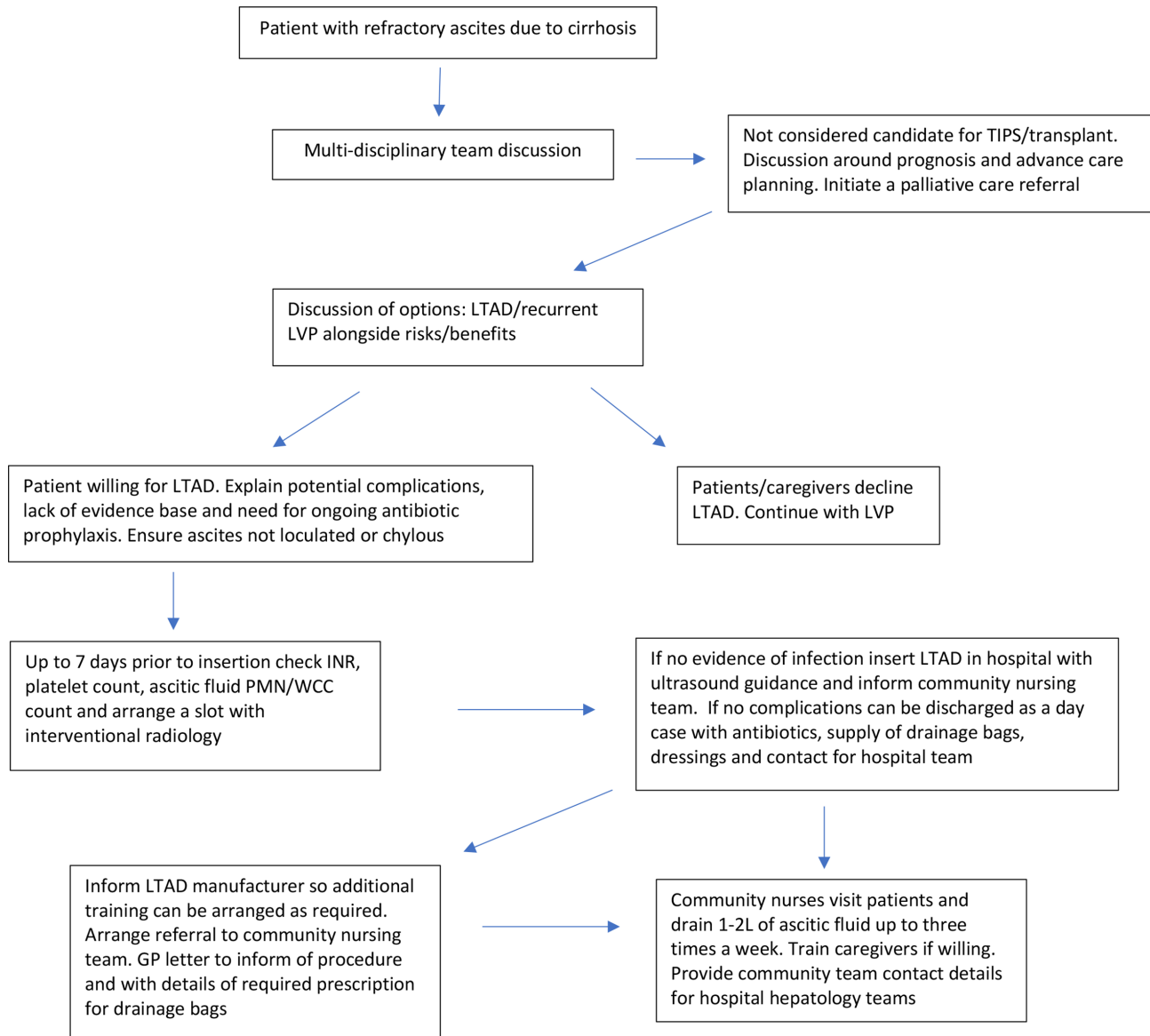
6.1 Patients should not undergo routine post LTAD insertion ascitic fluid sampling and/or clinical blood tests unless there is clinical suspicion of peritonitis.

6.2 LTAD removal is not necessarily required in patients who develop peritonitis.

6.3 Episodes of leakage and cellulitis are typically self-limiting and do not usually require LTAD removal.

6.4 Patients should be provided with written information describing LTAD management in case of an out-of-hours hospitalisation.

Peritonitis remains the main concern following LTAD insertion. In malignant ascites, tunnelled catheters reduce the risk of peritonitis (tunnelled vs non-tunnelled catheters 4.4% vs 21 %).<sup>39</sup> In a recent systematic review assessing LTAD in cirrhosis, peritonitis rates were 12.7%, the LTADs being removed in about half.<sup>6</sup> In the REDUCe study, peritonitis incidence in LTAD vs LVP group were 6% (1/17) vs 11% (2/19<sup>4</sup> (table 1)). We would not recommend routine sampling of ascitic fluid in asymptomatic patients as colonisation is almost universal after LTAD insertion,<sup>56</sup> the clinical significance of which remains unknown. Therefore, after LTAD insertion, only symptomatic patients (fever, abdominal pain, worsening hepatic decompensation or renal function) should be screened and treated for suspected infection/peritonitis as clinically appropriate. In those with suspected peritonitis, a sample should be taken from both the LTAD and via a separate ascitic tap. Removal of LTAD may not be



**Figure 2** Flow chart showing process for long-term abdominal drain insertion and community management (also see online supplemental file 1, for community standard operating procedure). GP, general practitioner; INR, international normalised ratio; LTAD, long-term abdominal drain; LVP, large volume paracentesis; PMN, polymorphonuclear; TIPS, transjugular intrahepatic portosystemic shunt; WCC, white cell count.

necessary in all cases of peritonitis. Leakage and cellulitis post LTAD insertion are usually self-limiting with antibiotic treatment, rates being 8% and 6%, respectively, in the systematic review,<sup>6</sup> consistent with a recent case series (3%).<sup>5</sup> In the REDUCe study, a higher incidence of cellulitis/leakage was observed (41%), though all were self-limiting.<sup>4</sup> Strategies to reduce leakage include: draining ascites to dryness following insertion, ensuring incisions are of appropriate size (may require a suture if too large) and ensuring that the tunnelled portion of the LTAD is not under undue tension.

Non-infectious LTAD complications such as catheter blockage and displacement are rare (6% and 1%, respectively),<sup>6</sup> bleeding is also very uncommon, only two cases being reported in the systematic review,<sup>6</sup> none of these complications observed in the feasibility trial.<sup>4</sup> In the afore-mentioned systematic review,<sup>6</sup>

increase in serum creatinine was observed in 8%. In the REDUCe trial,<sup>4</sup> mean serum creatinine remained stable in both groups (table 3). All patients should be provided with written information regarding LTAD management to assist medical teams in the event of an out of hours hospitalisation (see online supplemental file 2).

## CONCLUSIONS

Development of refractory ascites in advanced cirrhosis is a difficult time in the lives of patients and their caregivers as most are coming to terms with entering a palliative phase of their illness. Palliative interventions for refractory ascites remain a clear unmet need. Data from a recent small trial provides preliminary evidence of LTAD safety, efficacy, acceptability and cost-effectiveness. These results, however,

**Table 3** Potential long-term abdominal drain (LTAD)-related complications when used in end-stage liver disease

Complication	Recommended management	Incidence observed in the REDUCe trial (LTAD vs LVP) <sup>5</sup>
Leakage	Usually self-limiting, if persists may need an extra suture. Continue ascites drainage via LTAD	Leakage/cellulitis 41% vs 11%
Cellulitis	Usually results due to leakage and is again self-limiting. If persist may need a short course of antibiotics. Very rarely LTAD needs to be removed and can be resited	
Suspected peritonitis	Do a diagnostic tap for cell count and culture from peritoneum as well as taking sample from LTAD. Treat as per usual peritonitis guidelines. Decision to remove LTAD must be made on a case by case basis after discussion with patient/caregiver Routine sampling of ascitic fluid from LTAD and or routine blood tests in asymptomatic patients is not recommended.	6% vs 11%
Elevation in serum creatinine	Manage as clinically indicated	Baseline and week 12 serum creatinine (µmol/L) (median, IQR) LTAD vs LVP groups: 109 (79–141) vs 113.5 (89–134) and 104.5 (81–115.5) vs 127(63–158), respectively.
LTAD blockage	Admit to hospital and discuss need for replacement	0%
LTAD displacement	Admit to hospital if necessary and discuss need for replacement	6%
Bleeding	Usually self-limiting	0% vs 5%
Unable to manage ascites symptoms despite draining 1–2 L three times a week from LTAD	Will need LVP in hospital—drain ascitic fluid via LTAD using adaptor with human albumin solution as per standard LVP protocols	13%

LVP, large volume paracentesis.

need to be confirmed by the future definitive trial. Not all patients will be suitable for palliative LTAD, some preferring hospital-based LVPs, this being their only opportunity for social interaction. The complexities of a palliative intervention that crosses healthcare boundaries cannot be underestimated. The key to successful implementation of LTAD will be collaborative working between the hospital, community (including palliative services), primary care, patients and their caregivers. The future national LTAD study, besides providing definitive evidence, will increase knowledge, skills and confidence in managing advanced cirrhosis out of hospital, through shared learning between primary and secondary care. Hopefully this will improve palliative care for this disenfranchised and under-researched cohort.

#### Author affiliations

<sup>1</sup>Gastroenterology and Hepatology, University Hospitals Sussex NHS Foundation Trust, Brighton, UK

<sup>2</sup>Hepatology, Liverpool University Hospitals NHS Foundation Trust, Liverpool, UK

<sup>3</sup>Department of Palliative Care Medicine, King's College Hospital NHS Foundation Trust, London, UK

<sup>4</sup>Palliative Medicine, Queen Elizabeth University Hospital Campus, Glasgow, UK

<sup>5</sup>Liver Unit, Queen Elizabeth Hospital, Birmingham, UK

<sup>6</sup>Hepatology, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK

<sup>7</sup>Liver Unit, Freeman Hospital, Newcastle upon Tyne, UK

<sup>8</sup>King's College London, London, UK

<sup>9</sup>LIVERNORTH, Newcastle, UK

<sup>10</sup>Patient and Public involvement, Brighton, UK

<sup>11</sup>Hepatology, University Hospital Southampton, Southampton, UK

<sup>12</sup>Hepatology, Royal Devon and Exeter NHS Foundation Trust, Exeter, UK

<sup>13</sup>Clinical and Experimental Medicine, Brighton and Sussex Medical School, Brighton, UK

**Twitter** Joanne McDonagh @jomcDonagh2, Neil Rajoriya @NeilRaj1, Mhairi Donnelly @MhairiDonnelly and Mark Wright @marktheliverdoc

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## ORCID iDs

Fiona Finlay <http://orcid.org/0000-0001-8549-9231>  
 Neil Rajoriya <http://orcid.org/0000-0003-3892-2206>  
 Mhairi Donnelly <http://orcid.org/0000-0001-7655-7284>  
 Mark Wright <http://orcid.org/0000-0001-7046-241X>  
 Sumita Verma <http://orcid.org/0000-0001-7021-8409>

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