Palliative Long-term Abdominal Drains for the Management of Refractory Ascites due to Cirrhosis: A Consensus Document

Lucia Macken¹, Corrigan M², Prentice W³, Finlay F⁴, McDonagh J⁵, Rajoriya N⁶, Salmon C⁷, Donnelly MC⁷, Evans CJ⁸, Ganai B⁹, Bedlington J¹⁰, Steer S¹¹, Wright M¹², Ben Hudson¹³, Sumita Verma¹,¹⁴ on behalf of the British Association for the Study of the Liver/British Society of Gastroenterology (BASL/BSG) End of Life Special Interest Group

¹Department of Gastroenterology and Hepatology, University Hospitals Sussex NHS Foundation Trust, Brighton, UK
²Department of Hepatology, Aintree University Hospital, Liverpool, UK
³Department of Palliative Medicine, Kings College Hospital, London, UK
⁴Department of Palliative Medicine, Queen Elizabeth Hospital, Glasgow, UK
⁵Department of Hepatology, Queen Elizabeth Hospital, Birmingham, UK
⁶Department of Hepatology, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK
⁷Department of Hepatology, Freeman Hospital, Newcastle Upon Tyne, UK
⁸Cicely Saunders Institute, Kings College Hospital, London and Sussex Community NHS Foundation Trust, Brighton, UK
⁹Department of Radiology, University Hospitals Sussex NHS Foundation Trust, Brighton, UK
¹⁰Hon Treasurer and Governor, LIVErNORTH, Newcastle Upon Tyne, UK
¹¹Peer mentor, Brighton, UK
¹²Department of Hepatology, Southampton University Hospitals NHS Trust
¹³Department of Gastroenterology and Hepatology, Royal Devon and Exeter NHS Foundation Trust, Exeter, UK
¹⁴Department of Clinical and Experimental Medicine, Brighton and Sussex Medical School, Brighton, UK

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Corresponding author
Professor Sumita Verma
Brighton and Sussex Medical School, Main Teaching Building, Room 2.17
North South Road, Falmer, Brighton, BN1 9PX, UK
Phone: +44 (0) 1273 877890; Fax: +44 (0) 1273 877856
Email: s.verma@bsms.ac.uk
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 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.

Keywords liver cirrhosis, ascites, peritonitis, clinical trial

Key points

1. Nationally, cirrhosis related mortality has increased significantly over the last four decades
2. 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
3. Palliative long term abdominal drains are routinely used in refractory malignant ascites but are not standard of care in cirrhosis, pending results of a national definitive trial
4. Currently, outside of a research setting, long-term abdominal drains can be considered in cirrhosis on a case by case basis after careful patient selection
5. Patients being considered for long-term abdominal drains should be referred to palliative care services
6. 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. (1) Nationally, the COVID pandemic has resulted in a 20% increase in all cause alcohol-related deaths in 2020 compared to 2019. (2)

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 (3-4), funding has just been obtained for a definitive randomised controlled trial (RCT) comparing large volume paracentesis (LVP) vs. palliative LTADs in refractory ascites due to cirrhosis (HTA project: NIHR 133889). This intervention is also undergoing 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 (4-6), 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. (4-6)

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 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 (7-8), up to a third of patients progressing to refractory ascites. (9-10) The International Ascites Club Criteria defines refractory ascites as either (i) diuretic-resistant ascites or (ii) diuretic-intractable ascites. (11-12) Once refractory ascites develops, transplant free survival is 6-12 months. (9-10, 13-14). However, patients with refractory ascites are a heterogenous group, older age (> 60 years), presence of hepatocellular cancer and diabetes mellitus (DM) predicting poorer survival, whilst alcohol abstinence is independently associated with improved survival. (13)
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 (ALFA) pump. (15-16) Data from one UK secondary liver centre showed that from 2013-2015, only 14% of patients with refractory ascites were listed/underwent liver transplantation and/or TIPS (10), consistent with studies from Europe and America. (9,13-14) 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 2013-15, 13,181 (29%) required LVP in their last year of life, mean annual cost/person being > £21,000. (17)

In a recent systematic review pain and breathlessness, commonly observed with ascites, were reported by up to 88% of patients with cirrhosis. (18) 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. (18-22) Ascites is one of the main drivers of impaired HRQoL in advanced cirrhosis, both in patients and caregivers. (21, 23-27)

**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. (10, 28-31). Timely palliative care in cirrhosis can improve symptom control (32-33), address goals of care/advance care planning (34-35) and reduce hospitalisations. (4, 29, 36)

Approximately 75% of patients with advanced cirrhosis die in hospital (17, 37), compared to 40% with advanced cancer. (38) 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. (39-42) These tunnelled drains are inserted in hospital under local anaesthetic through the abdominal wall into the peritoneal cavity. Community nurses or informal caregivers (if willing), then drain small amounts (1-2 litres) 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 NHS. (39-42) Currently LTADs are not standard of care in advanced cirrhosis, ongoing concerns being community management
and the increased peritonitis (16) risk in cirrhosis. These concerns were evident in our national survey of BSG and BASL members. (43)

**Long-term abdominal drain use in advanced cirrhosis**

An earlier systematic review assessed LTADs in refractory ascites due to advanced cirrhosis (6), though most studies were rated as “poor” (Newcastle-Ottawa Scale). (44) 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%). (6, 39)

Recent data comes from the feasibility REDUCE trial (3-4), 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. (4) An embedded qualitative study indicated LTAD acceptability by patients and nurses. (45) 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 long-term abdominal drains**

1. **Selection of patients for LTAD insertion (Table 1)**
   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 suited to patients in whom there is a reasonable prospect of re-compensation (e.g. 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 contra-indications to LTAD insertion**

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

Consistent with recently published national and American guidance (16, 46), 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 (47), 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 (e.g. with improved nutritional status). In such instances however, the presence of a LTAD should not be an absolute contraindication for transplantation.

Once deemed to have true refractory ascites (11-12) and TIPS/transplant ineligibility, a LTAD could be a 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 (e.g. non-alcoholic fatty liver disease). In particular, the propensity to re-compensate in alcohol-related liver disease (upon 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 a 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 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 (e.g. is there a desire to be managed at home if possible, attitudes to LTAD etc.). 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. (45)

3. Peri-procedural 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 interventional radiology 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$^3$ /WCC <500 cells/mm$^3$ 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 Ltd, 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.
Table 2 shows the recommended checklist prior to LTAD insertion and Fig 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 (16, 48), 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 > 1.5 and or platelet count ≤50x10⁹/L. (Table 2) This would be standard practice for most interventional radiologists. (49)

There are no evidence-based guidelines on use of prophylactic antibiotics in setting of LTADs. NICE, European and BSG guidelines (16, 48, 50) recommend prophylactic antibiotics if total ascitic fluid protein is <15g/L. However, recent studies suggest that ascitic fluid protein may not predict peritonitis risk. (51-52) As already stated, peritonitis risk is more than two fold higher when LTADs are inserted in patients with cirrhosis compared to those with malignant ascites. (6,39) 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. (53) 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 (Tables 2 and 3)**

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**

LTAD insertion is done as a day case with ultrasound guidance, the technique having been previously described. (3) While at most sites, LTAD insertion will be performed by interventional radiology (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 a LTAD has been inserted it is recommended that the ascites is drained to dryness with human albumin solution (HAS) (20%) administered as per LVP protocol. (16, 48) This makes subsequent community management of ascites easier. Upon discharge, incontinence sheets should be provided as some leakage is to be expected along with approximately two weeks supply of drainage bags with
discharge notification being sent to the 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 (see Supplementary file 1 for community standard operating procedure)

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

5.2 Patients should have approximately 2-3 drainage procedures/week with up to 2 litres of ascites being removed on each occasion, with a maximum 5 litres of ascites drained/week. This will be sufficient for most patients.

5.4 Caregivers can be trained in LTAD drainage when appropriate/willing

5.5. 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 a 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 (4), we would recommend two to three nursing visits per week with 1-2Ls being drained at each visit with initially a maximum of 5L being drained each week (see Supplementary File 1 for community standard operating procedure). This will be sufficient for most patients.

A small proportion of patients (13% in the REDUCe study) (4), who remain symptomatic from ascites despite drainage of 5L/week in the community should undergo supplementary LVP in hospital (via the LTAD using drain specific adaptors), with HAS replacement as per LVP protocol. (16 ,48) In this small subset of patients who require LVPs in hospital despite 5L/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 out patient HAS remains contentious. Two recent studies gave conflicting results, those with advanced ascites less likely to benefit. (54-55) 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 to baseline in the LTAD group as regular HAS was not administered: 29.5 (27.5-31.5) vs. 33 (33-36). However, serum albumin levels then remained stable until end of study. (4) Week 12 serum albumin and serum creatinine were similar in both LTAD and LVP groups. (4) Fig 2 summarises the process for LTAD selection and management and Table 3 lists the do’s and don’ts.

6. Potential complications following long-term abdominal drain 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 %). (39) In a recent systematic review assessing LTAD in cirrhosis, peritonitis rates were 12.7%, the LTADs being removed in about half. (6) In the REDUCE study, peritonitis incidence in LTAD vs. LVP group were 6% (1/17) vs. 11% (2/19 (4) (Table 1). We would not recommend routine sampling of ascitic fluid in asymptomatic patients as colonisation is almost universal after LTAD insertion (56), 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 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 (6), consistent with a recent case series (3%). (5) In the REDUCE study a higher incidence of cellulitis/leakage was observed (41%), though all were self-limiting. (4) 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 tunneled 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) (6), bleeding is also very uncommon, only two cases being reported in the systematic review (6), none of these complications observed in the feasibility trial. (4) In the afore-mentioned systematic review (6), increase in serum creatinine was observed in 8%. In the REDUCE trial (4), mean serum creatinine remained stable in both groups. (Table 4) 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 Supplementary 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 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.
References


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

<table>
<thead>
<tr>
<th>Indications for LTAD</th>
<th>Contraindications for LTAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractory ascites defined as per International Ascites Club criteria with need for three or more large volume paracentesis Not eligible for TIPS +/- liver transplant</td>
<td>Absolute</td>
</tr>
<tr>
<td>Loculated/chylous ascites</td>
<td>Stage 4 CKD (eGFR &lt;30 ml/min)</td>
</tr>
<tr>
<td>Candidate for liver transplant/ TIPS</td>
<td>Prior life-threatening SBP</td>
</tr>
<tr>
<td>Actively dying i.e. expected die within days</td>
<td>Active infection</td>
</tr>
<tr>
<td></td>
<td>Reasonable possibility of recompensation</td>
</tr>
</tbody>
</table>

LTAD long-term abdominal drain, TIPS transjugular intrahepatic portosystemic shunt, CKD chronic kidney disease, SBP spontaneous bacterial peritonitis,
Table 2 Checklist prior to long-term abdominal drain insertion

Not a TIPS/liver transplant candidate and
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 ≥ 1.5 and platelet count ≤ 50x10^9/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
GP 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

LTAD long term abdominal drain, INR international normalised ratio
Table 3 Do’s and don’ts when inserting long-term abdominal drains for refractory ascites

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

LTAD long-term abdominal drain
Table 4 Potential long-term abdominal drain-related complications when used in end-stage liver disease

<table>
<thead>
<tr>
<th>Complication</th>
<th>Recommended management</th>
<th>Incidence observed in the REDUCE trial (LTAD vs. LVP) (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage</td>
<td>Usually self-limiting, if persists may need an extra suture. Continue ascites drainage via LTAD</td>
<td>Leakage/cellulitis 41% vs. 11%</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Suspected peritonitis</td>
<td>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</td>
<td>6% vs. 11%</td>
</tr>
<tr>
<td></td>
<td>Routine sampling of ascitic fluid from LTAD and or routine blood tests in asymptomatic patients is not recommended.</td>
<td></td>
</tr>
<tr>
<td>Elevation in serum creatinine</td>
<td>Manage as clinically indicated</td>
<td>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.</td>
</tr>
<tr>
<td>LTAD blockage</td>
<td>Admit to hospital and discuss need for replacement</td>
<td>0%</td>
</tr>
<tr>
<td>LTAD displacement</td>
<td>Admit to hospital if necessary and discuss need for replacement</td>
<td>6%</td>
</tr>
<tr>
<td>Bleeding</td>
<td>Usually self-limiting</td>
<td>0% vs. 5%</td>
</tr>
<tr>
<td>Unable to manage ascites symptoms despite draining 1-2L three times a week from LTAD</td>
<td>Will need LVP in hospital - drain ascitic fluid via LTAD using adaptor with human albumin solution as per standard LVP protocols</td>
<td>13%</td>
</tr>
</tbody>
</table>

LTAD long-term abdominal drain