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Reducing length of stay in patients following liver transplantation using the model for continuous improvement

Yashasavi Sachar ,[1] Abdulrhman Alamr,[1] Alan Gob,[2,3] Ephraim Tang,[4] Anouar Teriaky,[1] Karim Qumosani,[1] Corinne Weernink,[4] Melanie Dodds,[4] Kelly Thomas,[4] Lynne Sinclair,[4] Anton Skaro,[4] Mayur Brahmania[1,2]

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[1]Department of Medicine, Division of Gastroenterology, Western University, London, Ontario, Canada
[2]Center for Quality, Innovation and Safety, Western University, London, Ontario, Canada
[3]Department of Medicine, Division of Hematology, Western University, London, Ontario, Canada
[4]Department of General Surgery, Western University, London, Southeastern Ontario, Canada

Correspondence to
Mr Yashasavi Sachar;
ysachar2023@meds.uwo.ca

ABSTRACT

Length of stay (LOS) is a significant contributor to overall patient outcomes for patients undergoing liver transplantation. This study documents a quality improvement project aiming to reduce the median post-transplant LOS for liver transplant patients. We instituted five Plan–Do–Study–Act cycles with the goal of reducing LOS by 3 days from a baseline median of 18.4 days over 1 year. Balancing measures such as readmission rates ensured any decrease in stay was not associated with significantly increased patient complications. Over the 28-month intervention period and 24-month follow-up period, there were 193 patients discharged from hospital with a median LOS of 9 days. The changes appreciated during quality improvement interventions carried over to sustained improvements, with no significant variability in LOS postintervention. Discharge within 10 days increased from 18.4% to 60% over the study period, with intensive care unit stay decreasing from a median of 3.4–1.9 days. Thus, the development of a multidisciplinary care pathway, with patient engagement, led to improved and sustained discharge rates with no significant differences in readmission rates.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ As the number of patients on the liver transplant waitlist increases, it is crucial to optimise liver transplants workflow efficiency in order to increase the feasibility and capacity for procedure and address the impact of chronic liver disease. There are no formal quality indicators for postliver transplantation processes, but length of stay is a well-supported measurement of how similar systems operate.

WHAT THIS STUDY ADDS

⇒ This study demonstrates an example of applying the Plan–Do–Study–Act quality improvement technique to decrease length of stay in postliver transplant population, with the exceptional results of a decrease in mean duration of post-transplant stay from 18.4 days to 9 days over the course of five cycles, with sustained results postintervention.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ By providing an example of how to apply quality improvement principles to length of stay in transplant setting, this study provides context for healthcare sites to consider employing similar strategies to develop a workflow to address length of stay. It also provides foundational support for continued research in length of stay reduction and suggestions for metrics to enhance the comprehensive nature of intervention evaluation.

INTRODUCTION

For patients with end-stage liver disease, the only curative option often available is liver transplantation (LT). LT volume continues to grow to meet the needs of the patient population, with 8906 transplants completed in 2020 in America, a record high.[1] However, by the end of the year, there remained over 11,000 patients on the waitlist in need of LT.[1] With the strain placed by a mismatch between donor pool and supply, it is critical that completed LT's involve appropriate protocols to optimise patient outcomes and efforts are made for programmes to operate as high-quality health systems.

There are no formal guidelines regarding quality measures for LT to be used to assess the strength of an LT programme. The estimated operative costs of LT in Canada range from over US$$26 000 for in-province to over US$33 000 for out-of-province transplants when accounting for physician billing modifiers. Although the factors associated with the operative costs are difficult to address, the postoperative aspect of transplantation offers an opportunity to improve the patient experience and decrease the overall cost of LT.[2] Over the past decade, there has been significant developments regarding quality-of-care measurements that can be applied to this field, and length of stay (LOS) has been considered as a potential benchmark indicator for LT quality, given its current use as a quality benchmark in medicine. There is some precedent for the benefit of targeting LOS, with a shorter LOS not

only increasing procedure volumes, but also resulting in improved patient outcomes with fewer surgical complications.[3 4] Furthermore, LOS post-LT has been considered a potential quality indicator for transplantation.[5] Regarding factors impacting LOS, significant predictors of prolonged hospital stay (>8 days) include preoperative factors such as hospital admission, previous transplant, postoperative factors such as intensive care unit (ICU) admission, ventilator dependance, surgical site infection and intraoperative factors such as cold ischaemic time.[6] In terms of capacity for improvement, the postoperative environment is best suited for targeted intervention to while retaining appropriate patient outcomes. Thus, our study focuses on reducing LOS post-LT with post-transplant interventions through a quality improvement (QI) workflow.

A benchmark LOS ≤18 days post-LT has been previously suggested in a multicentre study, however, individual centres have been able to achieve an LOS between 8 and 11 days. The London Health Sciences Centre (LHSC) had a median LOS of 18 days post-LT prior to completion of this project. In this project, we aimed to reduce LOS days by 3 days over a 28-month period using the model for continuous improvement.[7]

METHODS

Context

The QI project was conducted at LHSC located in London, Ontario, Canada. The multiorgan transplant programme (MOTP) at LHSC performs 65–70 LT per year. We developed a multidisciplinary QI team, which consisted of relevant staff that are involved in the MOTP workflow. This includes transplant hepatologists, transplant surgeons, multiorgan transplant unit head nurse, nurse practitioners, social workers, physiotherapists and registered dietitians. Initial planning stage of project was initiated in July 2017 with a focus on addressing areas improvement regarding LOS. Patient workflow for post-transplant consists of transition to ICU, followed by discharge to MOTP unit. Regarding QI methodology, we chose to use the model for continuous improvement and instituted five Plan–Do–Study–Act (PDSA) cycles.

Aim statement

The aim of this project was to reduce the median LOS post-transplant from 18.4 days to 15.4 days (3 days) over a 1-year period.

Interventions

Prior to beginning the QI project, we completed a root cause analysis and identified factors associated with LOS as shown in an Ishikawa diagram (figure 1). We identified five core areas of focus, including surgical care factors, psychosocial factors, medical care factors, frailty and education. Our team met monthly to review data and evaluate feedback needed to help guide future PDSA cycles. PDSA cycles were then disseminated to all care providers during monthly Quality Assurance and Performance Improvement rounds. Overall, there was a 100% adherence to attendance (not including excused absences) for PDSA cycle review and planning meetings.

The first PDSA (n=23) cycle was started on August 2017–February 2018 and focused on educational sessions among LT team members and other specialists involved in the management of LT patients. We

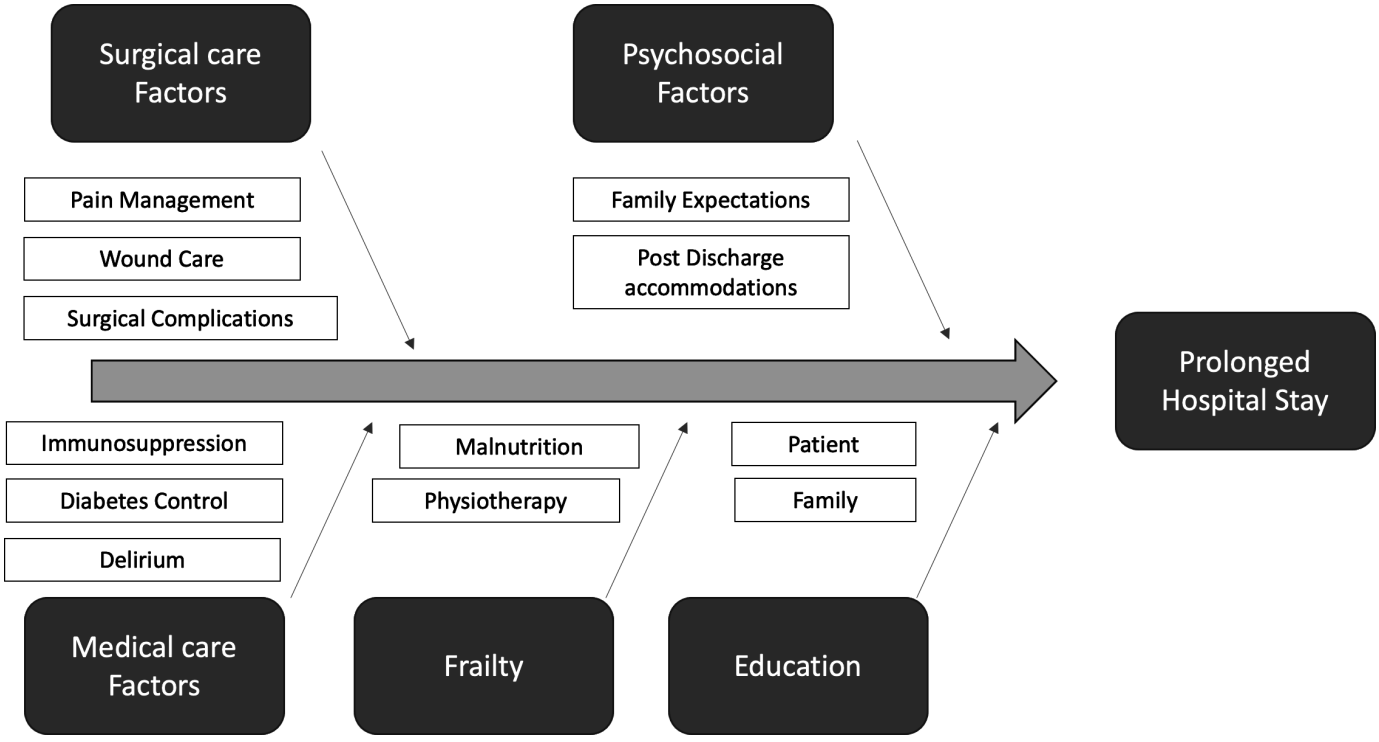

Figure 1 Ishikawa (fishbone) diagram showing factors related to prolonged hospital stay.

highlighted key post-LT factors including medical, surgical, psychosocial (including education) and frailty. This session was conducted through a presentation assembled by QI leads which outlined relevant factors and how they relate to patient care postoperatively. Content was sourced from completing a search for relevant literature regarding these factors, with the presentation involving a discussion regarding these studies and providing an overview of our existing protocols for post-transplant care and how they relate to these factors of patient health.

The second PDSA cycle (n=9) started on February 2018–April 2018 and involved an LT clinical pathway started from day 0 to day 10 after post-LT. This was initially developed following our monthly meetings based on stakeholder input regarding the optimal clinical pathway for LT post-transplant workflow. The clinical pathway outlined the specific expectations regarding management for LT patients and the necessary referrals for consultations and allied health professional involvement that should be completed within the first 10 days, attempting to increase compliance to timely integrated care. For further detail, this has been provided in (online supplemental file 1). Some of the components of this clinical pathway that were set out included physiotherapy involvement on postoperative day (POD) 0 for assessment and progression to movement, nurse involvement for medication teaching on POD 1, surgical fellow involvement on POD 2 to remove foley, and access to a registered dietician to ensure a feeding plan was initiated shortly after LT. Once our initial patient pathway was completed, no further changes were made to it during dissemination . Roll-out involved a patient path being placed in patient rooms, as well as on the nurse's flow sheet for reference. For staff that consistently work in the MOTP, one-on-one conversations were had to engage them in the study, with the involvement of a nurse education from the MOTP. Regarding additional allied healthcare staff, it was sent as an email.

The third PDSA cycle (n=14) started on April 2018–July 2018 involved instituting a clinical order set in our electronic medical records. We recognised that for our interventions to be effective there needed to be appropriate uptake by the medical professionals involved in decision making for ongoing management of patient care. The clinical order set integrated orders that were part of patient management into a grouped set for increased efficiency and streamlined workflow. As was the case in cycle development throughout project, stakeholder input was involved in generating order set. Further, this cycle also involved a clinical informatician. Decisions regarding content of order set were confirmed with senior author after drafting based insight from stakeholders. For further detail regarding the order set generated by our team, please refer to online supplemental file 2. The purpose of developing this workflow was to increase the utility of the pathway, as an easier to use pathway was more likely to be adhered by involved stakeholders. Use of order set was assessed through study's family of measured variables and impact on LOS as seen in run chart.

The fourth PDSA cycle (n=37) started July 2018–April 2019 as we recognised that patients and family members expectations were at times discordant with the goals of the medical team for assessing for earlier discharge given the perceived grandiosity of LT. For example, patient families would often prefer patients remained in the hospital for longer feeling this was directly related to the patient's recovery. Furthermore, patient's families would often also suggest modifications to the patient's discharge plan to develop a plan that may be more convenient for home-planning but difficult to coordinate such as a patient discharge being delayed from Friday to Monday. We felt we could manage these expectations with a patient oriented clinical pathway. Our patient-oriented clinical pathway involved an education-focused intervention, occurring prior to the LT itself. This clinical pathway focused on educating family members regarding our model for care and the criteria for discharge, along with the benefits of early discharge and the process of assessment prior to discharge to improve confidence in our model. The patient education intervention was delivered each time in a standardised manner by a nurse educator who worked with MOTP. If the interaction was occurring between another member of the medical team and the patient's family—the MOTP nurse would remain to observe. Through this involvement, the nurse practitioner was able to help guide conversations towards the educations focused protocol if deviated and help support consistency between interactions.

The fifth PDSA cycle (n=30) started in April 2019–Dec 2019 as we recognised there were often logistic barriers for discharge. These barriers were often associated with processes involved in patient preparation post-LT for management as a LT patient, such as poor adherence to medication, limited understanding of diabetes management and no preplanned discharge transport. Rather than direct a specific individual for each specific need, we developed a list of goals for patient postoperative education and discharge planning that was distributed to the team as well as the MOTP charge nurse. These included goals such as improving patient understanding of medication and initiating supports for medication delivery if required (such as blister packs), as well as developing a plan for discharge disposition prior to initiating procedural workflow. Thus, the focus of this cycle was to adapt the role of MOTP charge nurse to identifying these gaps in compliance through daily involvement in morning rounds, at which point the charge nurse would be able to highlight needs to be addressed by the remainder of MOTP team.

Family of measures

Prior to initiation of study, the team agreed on the essential family of measures. The primary outcome measure for this study is the LOS post-LT, defined as the duration (in days) from day of admission to ICU post-LT until the day

of discharge from the MOTP inpatient unit. We did not evaluate whether patients were repatriated to hospital, home or other long-term care units (such as the geriatric rehabilitation unit) as this was dependent on other external factors, such as bed availability, and majority of patients were discharged directly from the MOTP unit to home. A secondary outcome measure was ICU LOS, defined as duration from the day of admission to ICU and transfer to the MOTP inpatient unit. Primary balancing measure for this project was readmission rate, recorded as 30-day and 90-day rates, with the goal of ensuring that patients who were being discharged through our workflow were not facing increased complications. Readmission rate was defined as the number of recipients readmitted to LHSC following discharge after LT divided by the total number of patients discharged. Comparison of readmission rates was done through two-sample z test of proportions. Data collection was done retrospectively to ensure safety was always maintained and to avoid premature discharges. Fidelity measures for the study included attendance to meetings regarding review and planning, based on the PDSA cycle structure.

Baseline analysis

Our baseline data collection took place between January 2015 and August 2017. We captured data regarding initial date of transfer to ICU post-LT, the date of transfer from ICU to the MOTP inpatient service and the date of discharge. We also captured any 30-day or 90-day readmissions required for patient, as part of our balancing measures. Of note, there was a single special-cause variation event associated with the baseline for this project, which was an outlier, representing a month with an n=1 including a patient with a prolonged stay of 71 days postoperative, and thus was not accounted for when confirming baseline stability of variation.

Statistical analysis

Mean per-month LOS was plotted on a Statistical Process Control (SPC) Chart using QI Macros.

RESULTS

Results were plotted on an SPC chart (figure 2). Prior to our QI inititative, the median LOS post-LT (n=130)

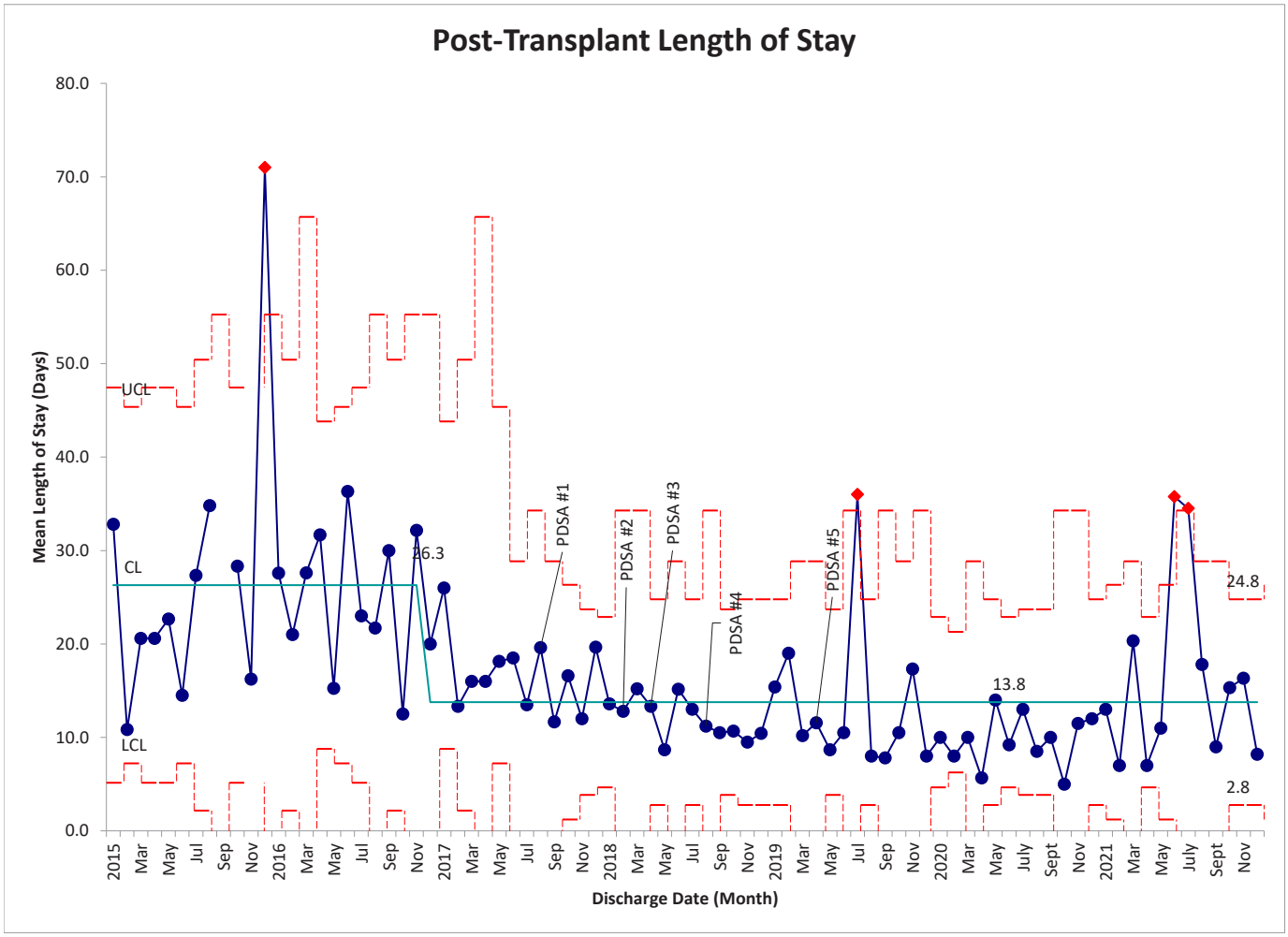

Figure 2 Statistical process control chart demonstrating monthly mean LOS at baseline observation period, during Plan–Do–Study–Act (PDSA) cycles, and postquality improvement intervention in long-term observation. Demonstrates upper control limit and lower control limit. LOS, length of stay.

between January 2015 and August 2017 was 18.4 days. Over a 28-month period during which PDSA cycles were completed, 113 LT patients were discharged from the hospital with a median LOS of 9.0 days. The median sample size for each month was 4 (IQR 3–5). The LOS post-LT was sustained for 24 months after the PDSA cycles were completed, over which 80 LTs occurred. The 30-day and 90-day readmission rates, used as balancing measures, were determined to be 19.0% and 25.6%, respectively, compared with 15.4% and 22.7% in baseline assessment period, with no significant difference with p>0.05. Preintervention, discharge within 10 days occurred in 18.4% of patients but increased to 60% over study period. ICU LOS also decreased throughout study period from a median of 3.4 days preintervention to 1.9 days.

DISCUSSION

Over the course of this study, using the model for continuous improvement, we were able to decrease and sustain the median post-LT LOS by 9.0 days with no significant increases in readmission rates at 30 and 90 days. This project offers an example of the feasibility of initiating such QI projects at LT centres with an account of potential stakeholders and ideas for driving change in a sustainable and practical manner.

The SPC chart identifies an interesting trend, suggesting change to the underlying process began in March 2017, preceding the initial PDSA cycle in August 2017. This is a known limitation of this study, and there is no definitive explanation for this phenomenon but, we surmise changes were associated with an influential surgical member joining the transplant team around this period. We believe the addition of staff is unlikely to be the primary driver of the changes seen as each staff will only rotate on-service every 4 weeks. Moreover, it is unlikely such sustainability is consistent with a single staff change as it continues to persist throughout intervention and postintervention whether staff was on service or not. Furthermore, there was a high compliance rate for team involvement in PDSA cycles, with strong fidelity measures increasing the likelihood for our intervention to be associated with changes appreciated in study. We believe the most likely cause for the efficacy of our interventions is the multifaceted approach which was applied and the high degree of compliance. As we had built interventions to target different touch points of care, we were gradually able to build a culture of change where majority of staff were cognizant of the goals and aware of the evidence supporting the utility of maintaining these behaviours. Regarding individual cycles, it is likely the cycles that adjusted workflow, such as PDSA cycle 3, were more likely to result in a sustainable change in comparison to education-based cycles as they generated a lasting product. This is consistent with existing research reviewing measures for QI improvement in Hepatology, which demonstrate workflow-associated changed are more frequently successful, whereas education-based initiatives are less likely to generate sustainable impacts.[8]

A common limitation regarding QI projects is the Hawthorne effect, and previous studies have demonstrated a return to mean values often occurs between 10 and 15 observations after the initial change is made.[9] In comparison, the decrease in LOS in our study was maintained over a 24-month follow-up period, with no significant change in median LOS. While some special-cause variation occurred, this is expected with a small sample size and a population with highly variable data, given patient potential to decompensate postoperatively, resulting in prolonged stays. Additionally, we believe that future studies should consider additional measurements and direct formalised feedback to assess the efficacy of educational interventions, as this was not included within our family of measures. Further, we did not account for measures specific to the patient perspective. LOS has been evaluated as a factor in patient satisfaction, with recent surgical studies demonstrating prolonged LOS associated with decreased patient satisfaction and likelihood of recommending hospital to others.[10] Although this would suggest that being decreasing LOS would result in increased patient satisfaction, we did not confirm this through our work and this should be considered in future studies to develop a comprehensive evaluation of the utility of the initiative.

By using the model for continuous improvement, we were able to decrease the median LOS post-LT by 9.0 without significantly impacting 30-day and 90-day readmission rates. Our study demonstrates a promising proof-of-concept regarding the application of QI principles to addressing LOS in post-LT patients. Our intention on the onset of study was to develop a model that is feasible and practical. Interventions were generated as to mitigate costs for the home programme and relied on optimising existing processes. Thus, this model can be considered for application to other areas of surgical management as it has a low opportunity cost for execution. It also demonstrates an approach that does not require a large team with QI knowledge, as majority of our cycles required only a QI lead with understanding of the field, and remainder of the team having minimal training in QI. For centres with a low number of staff with formal training, this can be reassuring and encourage them to consider applying their own QI initiatives using their insight into workflow and factors impacting patient care.

Twitter Alan Gob @agob2007

Contributors Study design: AA, CW and MB. Data analysis: YS, AA, AG, CW and MB. Manuscript writing: YS, AA, AG and MB. Editing/review: YS, AA, ET, AT, KQ, AS and MB. Study Guarantor is MB.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This project was classified as a QI investigation based on the requirements listed in the Tri-Council Policy Statement, thus, ethics approval was waived by local research ethics board. Patient confidentiality was protected throughout, and all data analysed was deidentified.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

ORCID iD

Yashasavi Sachar http://orcid.org/0000-0003-4900-4101

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London Health Sciences Centre
Multi-Organ Transplant Program

Liver Transplant Clinical Pathway

Post-Operative Day (POD)	POD 0	POD 1	POD 2	POD 3	POD 4	POD 5	POD 6	POD 7-10
Milestones								
	Transfer to Multi-Organ Transplant Unit							Discharge from Hospital
								Medication Scripts 24 hours prior to D/C
Consults								
	Physiotherapy			Dietician	Endocrinology if required			
	Infectious Diseases							
	Social Work							
Vital Signs								
Vital Signs	q 1h	q 1h	q 4h	q 8h	q 8h	q 8h	q 8h	q 8h
Cardiac Monitoring			D/C Cardiac Monitor					
Respiratory								
	Extubate per ICU	Oxygen Therapy						
	If increased risk of bleeding or vessels concerns during OR - Do NOT extubate until after liver ultrasound	Oxygen Titration q Target: SpO2≥92% q Target: SpO2 88-92% (CO2 retainers)						
Diagnositic Imaging								
	Chest AP Portable	Liver ultrasound (within 24						
	12 lead ECG							
Patient Care								
Weight	daily	daily	daily	daily	daily	daily	daily	daily
Intake and output	q 1h	q 1h	q 4h	q 12h	q 12h	q 12h	q 12h	q 12h
CVP	Target: 7-10							
Central Lines	PA catheter removed in OR and replaced with triple lumen		Triple lumen removed					
Foley				Remove Foley Catheter				
Drain/Tube Care - Malecot				Remove Malecot				
Drain/Tube Care - HMV						Remove Hemovac Drain		
Wound assessment		daily	daily	daily	daily	daily	daily	daily
Dressing			Dressing change 48hrs post-op		Dressing change POD 4 D/C dressing to air if dry	Dressing change daily D/C dressing to air if dry		
Diet								
	NPO	Clear Fluids	Diet As Tolerated	Diet As Tolerated	Diet As Tolerated	Diet As Tolerated	Diet As Tolerated	Diet As Tolerated
Activity								
	Dangle at bedside	Activity As Tolerated	Activity As Tolerated	Activity As Tolerated	Activity As Tolerated	Activity As Tolerated	Activity As Tolerated	Activity As Tolerated
		Chair	Chair for meals	Chair for meals	Chair for meals	Chair for meals	Chair for meals	Chair for meals
			Walk with assist	Walk 2x/day	Walk 2x/day	Walk 3x/day	Walk 3x/day	Walk 3x/day
					Exercise class	Exercise class	Exercise class	Exercise class
							Stair assessment	
Education								
			Transplant Education Binder	Transplant Education Video	Nursing Education - Infection and Rejection	Discharge Planning	Discharge Calendar	Medications - Pharmacist (Day before Discharge)
					Initiate subnormothermic machine perfusion		Post-operative Day 7-10 Education if D/C Post-operative Day 7	Patient Visit to Out Patient Pharmacy (Day before Discharge)

Approved by Paul Marotta. Anton Skaro - 2018 Feb 08
Revised 2018 12 03 Anton Skaro

London Health Sciences Centre
Multi-Organ Transplant Program

Liver Transplant Clinical Pathway

Post-Operative Day (POD)	POD 0	POD 1	POD 2	POD 3	POD 4	POD 5	POD 6	POD 7-10
Laboratory								
Point of Care Tests								
Point-of Care Glucose	q 6h	q 6h	q 12h	q 12h	q 12h	q 12h	q 12h	q 12h
Point-of Care Hemoglobin	q 6h x 24 hours							
Point-of Care Lactate	q 6h x 24 hours							
Point-of Care Electrolytes	q 6h x 24 hours							
Chemistry								
Electrolytes	q 12h x 24 hours	daily						
Urea	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Creatinine	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Albumin	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Calcium	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Magnesium	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Lactate	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Glucose, random	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Hematology								
CBC	q 6h x 24 hours	q 12h	daily	daily	daily	daily	daily	daily
Coagulation								
INR/PTT	q 6h x 24 hours	q 12h	daily	daily	daily	daily	daily	daily
Fibrinogen	q 12h	q 12h	daily	daily	daily	daily	daily	daily
Liver Function/Enzymes								
Bilirubin, direct	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
Bilirubin, total	q 12h x 24 hours	daily	daily	daily	daily	daily	daily	daily
ALT	q 6h x 24 hours	q 12h	daily	daily	daily	daily	daily	daily
AST	q 6h x 24 hours	q 12h	daily	daily	daily	daily	daily	daily
ALP	q 6h x 24 hours	q 12h	daily	daily	daily	daily	daily	daily
Transplant Lab								
DSA	once							
Other								
☑ Tacrolimus level *(Target 8-12)*		daily	daily	daily	daily	daily	daily	daily
Medications								
VTE Prophylaxis								
Immunosuppression								
☑ Tacrolimus	*as per Hepatology*							
☑ Prednisone	*Liver Transplant Prednisone Taper Module*							
☑ MMF/Cellcept		*as per Hepatology (once platelets ≥50)*						
❑ Simulect/Basiliximab (if indicated by impaired renal function)	*as per Hepatology - first dose given pre transplant*				20 mg			
Antimicrobials								
☑ Ceftriaxone	1 g, IV q 24h x 48 hours							
☑ Metronidazole/Flagel	500 mg, IV, q 12h x 48 hours							
☑ Fluconazole	100 mg daily x 7 days *for high risk recipients 400 mg daily x 4 weeks - see prophylaxis protocols*							
Antivirals								
❑ Valganciclovir (if CMV mismatch)	*as per Hepatology*							
Analgesics								
☑ Hydromorphone	*as per Surgery*							
☑ Acetaminophen	*as per Surgery*							
Other								
☑ ASA	81 mg, daily (once platelets ≥40 and INR <1.5)							
☑ Electrolyte Replacement	*as per Electrolyte Replacement Protocol*							

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Revised 2018 12 03 Anton Skaro

London Health Sciences Centre
Multi-Organ Transplant Program

Liver Transplant Clinical Pathway

Post-Operative Day (POD)	POD 0	POD 1	POD 2	POD 3	POD 4	POD 5	POD 6	POD 7-10
❑ Alprostadil/Prostiaglandin (if indicated by marginal donor graft, DCD organ, high AST, CIT >10 hours)	*as per Hepatology; recommended 0.1 mcg/kg/hr, increase q hr by 0.1 to max rate 0.5 mcg/kg/hr (maintain SBP > 90) - continue until AST <1000*							

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Table 1: Transplant Liver Prednisone Taper (Module)

Transplant Liver Prednisone Taper (Module)			
Incl		Communication Order	LHSC-UH
		Nurse to notify MD to change prednisone PO to methylprednisone IV if pt becomes NPO	
		Start (Initiation of Therapy) (Note)	
Incl		predniSONE	LHSC-UH
		60 mg, tab, ORAL, ONCE, Start: T+1;0800	
		Step 1: (Note)	
Incl		predniSONE	LHSC-UH
		50 mg, tab, ORAL, ONCE, Start: T+2;0800	
		Step 2: (Note)	
Incl		predniSONE	LHSC-UH
		40 mg, tab, ORAL, ONCE, Start: T+3;0800	
		Step 3: (Note)	
Incl		predniSONE	LHSC-UH
		30 mg, tab, ORAL, ONCE, Start: T+4;0800	
		Step 4: Ongoing therapy (Note)	
Incl		predniSONE	LHSC-UH
		20 mg, tab, ORAL, daily, Start: T+5;0800	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH

Table 2: Transplant Liver Assessment

Laboratory			
		Group and Screen (LHSC/SJHC)	LHSC-UH
		IPAC recommends a CPE screening program at LHSC for patients with a history of out of country healthcare (Inpatient admission, surgery, dialysis) in the past 12 months. (Note)	
		Carbapenemase Producing Enterobacteriaceae Screen Test (CPET)	LHSC-UH
		Routine T;N	
Hematology			
		LAB - Iron Overload Screen (Module)	LHSC-UH
		Glycated Hemoglobin (GLYHB)	LHSC-UH
		Routine, T;N, Blood	
Incl		Complete Blood Count (CBC)	LHSC-UH
		Routine, T;N, Blood	
Incl		INRPTT	LHSC-UH
		Routine, T;N, Blood	
General Chemistry			
Incl		Alphafetoprotein(Nonpregnant),Serum (AFPN)	LHSC-UH
		Routine, T;N, Blood	
Incl		Calcium,Serum,Plasma (CA)	LHSC-UH
		Routine, T;N, Blood	
Incl		Creatinine (CRE)	LHSC-UH
		Routine, T;N, Blood	
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		Routine, T;N, Blood	
Incl		Ethanol Level,Serum (ALC)	LHSC-UH
		Routine, T;N, Blood	
Incl		Glucose,Random (GLUR)	LHSC-UH
		Routine, T;N, Blood	
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		Routine, T;N, Blood	
Incl		TSH (3rd Generation),Serum (TSH)	LHSC-UH
		Routine, T;N, Blood	
Incl		Urea (U)	LHSC-UH
		Routine, T;N, Blood	

		Alpha-1-Antitrypsin,Serum (A1AT)	LHSC-UH
		Routine, T;N, Blood	
		Anti-Nuclear Antibody,Serum (ANA)	LHSC-UH
		Routine, T;N, Blood	
		Autoimmune Liver Disease Profile,Serum (AILDP)	LHSC-UH
		Routine, T;N, Blood	
		CA19-9,Serum (CA199S)	LHSC-UH
		Routine, T;N, Blood	
		Ceruloplasmin,Serum (CER)	LHSC-UH
		Routine, T;N, Blood	
		Immunoglobulins GAM,Serum (IGAM)	LHSC-UH
		Routine, T;N, Blood	
		Prostate Specific Antigen,Serum (PSA)	LHSC-UH
		Routine, T;N, Blood	
		Zinc,Plasma (ZNP)	LHSC-UH
		Routine, T;N, Blood	
Liver Function/Enzymes			
Incl		LAB - HLA Assessment - Liver Recipient (Module)	Facility Flexing Not Defined
Incl		Albumin,Serum,Plasma (ALB)	LHSC-UH
		Routine, T;N, Blood	
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		Routine, T;N, Blood	
Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		Routine, T;N, Blood	
		Aspartate Aminotransferase (AST)	LHSC-UH
		Routine, T;N, Blood	
Incl		Bilirubin,Direct (BILD)	LHSC-UH
		Routine, T;N, Blood	
Incl		Bilirubin,Total (BILT)	LHSC-UH
		Routine, T;N, Blood	
Incl		Prealbumin,Serum (PALB)	LHSC-UH
		Routine, T;N, Blood	
Microbiology			
		Urinanalysis (DIPU)	LHSC-UH

		Routine, T;N, Urine	
		Electrolytes,Urine (LYTEU)	LHSC-UH
		Routine, T;N, Urine	
		Sodium,Urine,Random (NAU)	LHSC-UH
		Routine, T;N, Urine	
Serology			
		LAB - MOTU Viral Serology (Module)	LHSC-UH
		LAB - Hepatitis Recipient Transplant Screen (Module)	LHSC-UH
Incl		Hepatitis B Screen (HpBpanel)	LHSC-UH
		Routine, T;N, Blood	
		Hepatitis B DNA (HpBDNA)	LHSC-UH
		T;N, Blood	
		Hepatitis C RNA Quantitative - Viral Load (HpCRNAQ)	LHSC-UH
		Routine, T;N, Blood	
Blood Gases			
		Blood Gas (BG)	LHSC-UH
		Routine, T;N	
Diagnostic Imaging			
		Chest PA/Lat	LHSC-UH
		US Abdomen/Pelvis	LHSC-UH
Nuclear Medicine			
		NM myocardial perfusion rest study	LHSC-UH
Other Diagnostic Testing/Treatment			
		ECG 12 Lead	LHSC-UH
		T;N	
		Echo Routine	LHSC-UH
		Echo Bubble	LHSC-UH
Consults			
		Consult to Physician	LHSC-UH
		Service: Hepatology	
		Consult to Physician	LHSC-UH

		Service: Transplant	
		Consult to Physician	LHSC-UH
		Service: Anesthesia	
		Consult to Physician	LHSC-UH
		Service: Dentistry	
Allied Health			
		Physiotherapy Referral	LHSC-UH
		Routine, Transplant Candidate Assessment	
		Social Work Referral	LHSC-UH
		Routine, Assess, Other, transplant patient	
		Dietitian Referral	LHSC-UH
		Routine, Recommend oral diet, transplant patient	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH

Table 3: Transplant Liver Transfer to Multi-Organ Transplant Unit

Resuscitation Status			
		Please ensure the resuscitation documentation is completed/reviewed (Note)	
Diet			
		Tube Feed + Food LHSC	LHSC-UH
		Advance Diet as Tolerated	LHSC-UH
		Clear Fluids with Supplements	LHSC-UH
		Regular Diet LHSC	LHSC-UH
		Sodium 87 mmol (2 g)	
Activity			
Incl		Activity as Tolerated	LHSC-UH
Vital Signs			
Incl		Vital Signs	LHSC-UH
		per protocol (Def)	
		daily	
		q1 hour.	
		q12 hours.	
		q2 hours.	
		q3 hours.	
		q30 days	
		q30 minutes	
		q4 hours.	
		q6 hours.	
		q8 hours.	
		weekly	
Patient Care			
Incl		POC Blood Glucose	LHSC-UH
		BID	
Incl		Cardiac Monitoring	LHSC-UH
		Arrhythmia (known or suspected)	
Incl		Weight	LHSC-UH
		daily.	

Incl		Intake and Output	LHSC-UH
		q1 hour. 2 day, then re-assess	
Incl		Drain/Tube Care	LHSC-UH
		Hemovac Drain	
Incl		Dressing Change	LHSC-UH
		daily.	
Incl		lidocaine 1% injectable solution	LHSC-UH
		10 mL, injection, intraDERMAL, ONCE	
Respiratory Care			
		Oxygen Therapy	LHSC-UH
Incl		Oxygen Titration	LHSC-UH
		Target: SpO2 greater than or equal to 92% (Def)	
		Target: SpO2 88-92% for CO2 Retention	
Continuous Infusions			
		BLOOD TRANSFUSION - Albumin 25% (Alb 25%) - Product Only	LHSC-UH
		BLOOD TRANSFUSION - Albumin 5% (Alb 5%) - Product Only	LHSC-UH
IV Maintenance Therapy			
		dextrose 5%-sodium chloride 0.45%	LHSC-UH
		IV continuous, 50 mL/hr (Def)	
		IV continuous, 75 mL/hr	
		dextrose 5% in water (D5W)	LHSC-UH
		IV continuous, 50 mL/hr (Def)	
		IV continuous, 75 mL/hr	
Medications			
		Ensure medication reconciliation continues appropriate medications for MOTS (Note)	
		ENDO - Subcutaneous Insulin Correctional Scale (Module)	LHSC-UH
		CRIT CARE - Electrolyte Replacement (Module)	Facility Flexing Not Defined
		lansoprazole	LHSC-UH
		30 mg, DR cap, ORAL, daily	
		ondansetron	LHSC-UH
		4 mg, tab, ORAL, q8 hours, PRN (Def)	
		8 mg, tab, ORAL, q8 hours, PRN	

		ondansetron injection	LHSC-UH
		8 mg, injection, IV, q8 hours, PRN (Def)	
		4 mg, injection, IV, q8 hours, PRN	
		Comments - Must be given by intermittent IV infusion to patients 65 and older	
Incl		Septra DS 800 mg-160 mg oral tablet	LHSC-UH
		1 tab, tab, ORAL, daily Mon,Wed,Fri	
Analgesics			
		acetaminophen	LHSC-UH
		650 mg, tab, ORAL, q6 hours, PRN pain	
		Comments - max 4 g acetaminophen in 24 hr from all sources	
		gabapentin	LHSC-UH
		100 mg, cap, ORAL, TID	
Analgesics: Opioids			
		HYDROmorphone	LHSC-UH
		2 mg, tab, ORAL, q4 hours PRN pain	
		HYDROmorphone injection	LHSC-UH
		1 mg, injection, SUBCUTANEOUS, q1 hour PRN for pain	
		traMADol	LHSC-UH
		50 mg, tab, ORAL, q6 hours PRN	
Laboratory			
		FK506 Level,Whole Blood (FK)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Hematology			
Incl		Complete Blood Count (CBC)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
		Complete Blood Count and Differential (CBCD)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		INRPTT	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
General Chemistry			
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	

Incl		Calcium,Serum,Plasma (CA)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Phosphate (PHO)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Urea (U)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Creatinine (CRE)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Glucose,Random (GLUR)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Liver Function/Enzymes			
Incl		Bilirubin,Total (BILT)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
		Aspartate Aminotransferase (AST)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Incl		Albumin,Serum,Plasma (ALB)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 5 day	
Allied Health			
Incl		Dietitian Referral	LHSC-UH
		Routine, Other - See Referral Details, transplant patient	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH

Table 3: Transplant Liver Pre-Operative

Resuscitation Status			
	Pers	Please ensure the resuscitation documentation is completed/reviewed (Note)	
Diet			
Incl		NPO	LHSC-UH
Activity			
Incl		Activity as Tolerated	LHSC-UH
Vital Signs			
Incl		Vital Signs	LHSC-UH
		per protocol (Def)	
		daily	
		q1 hour.	
		q12 hours.	
		q2 hours.	
		q3 hours.	
		q30 days	
		q30 minutes	
		q4 hours.	
		q6 hours.	
		q8 hours.	
		weekly	
Patient Care			
		Patient's consent for liver transplant must be documented. (Note)	
Incl		Notify Provider	LHSC-UH
		Once patient arrives on unit	
Incl		Saline Lock Insertion	LHSC-UH
Incl		Antiembolic Stockings	LHSC-UH
		If patient admitted from home, send stockings to OR	
Incl		Pneumatic Compression Device	LHSC-UH
		If patient admitted from home, send stockings to OR	
Medications			
Incl		COMMON - Venous Thromboembolism (VTE) Prophylaxis (Module) (LHSC-UH, VC, PW, STEGH, TDMH)	LHSC-UH
Incl		ceFAZolin	LHSC-UH

		2 g, injection, IV, on CALL, for: 2 dose	
		Comments - Send second dose into OR	
Incl		metroNIDAZOLE	LHSC-UH
		500 mg, injection, IV, on CALL	
		Comments - Send to OR	
Incl		methylPREDNISolone sodium succinate	LHSC-UH
		500 mg, injection, IV, on CALL	
		Comments - Send to OR	
		If patient has penicillin allergy, then order vancomycin. (Note)	
		vancomycin	LHSC-UH
		1 g, injection, IV, on CALL, infuse over 60 min, for: 1 dose	
		Hepatitis B Immune Globulin (HBIG) - Liver Transplant	LHSC-UH
Immunosuppression			
		basiliximab	LHSC-UH
		20 mg, injection, IV, on CALL, infuse over 30 min	
		Comments - send to OR with patient	
Laboratory			
		LAB - HLA Pre-Op - Liver Recipient (Module)	LHSC-UH
		Group and Screen (LHSC/SJHC)	LHSC-UH
		Now, T;N, Blood	
Hematology			
Incl		Complete Blood Count (CBC)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		INRPTT	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Fibrinogen, Plasma (FIB)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
General Chemistry			
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Urea (U)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Creatinine (CRE)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	

Incl		Glucose,Random (GLUR)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Calcium,Serum,Plasma (CA)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Liver Function/Enzymes			
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Albumin,Serum,Plasma (ALB)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
		Aspartate Aminotransferase (AST)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Bilirubin,Direct (BILD)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Incl		Bilirubin,Total (BILT)	LHSC-UH
		Now, T;N, Blood, Frequency: ONCE	
Blood Gases			
		Conditional If/Then	LHSC-UH
		If O2 sats below 94%, Then order blood gas	
Microbiology			
		Urinanalysis (DIPU)	LHSC-UH
		Now, T;N, Urine	
Serology			
Incl		Cytomegalovirus IGG,Serum (CMVIGG)	LHSC-UH
		Now, T;N, Blood	
Incl		Epstein Barr Virus IgG,Serum (EBVIGG)	LHSC-UH
		Now, T;N, Blood	
Diagnostic Imaging			
Incl		Chest PA/Lat	LHSC-UH
Other Diagnostic Testing/Treatment			
Incl		ECG 12 Lead	LHSC-UH

		T;N	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH

Table 4: Transplant Liver Post-Operative

Resuscitation Status			
	Pers	Please ensure the resuscitation documentation is completed/reviewed (Note)	
Diet			
Incl		NPO	LHSC-UH
Incl		Advance Diet as Tolerated	LHSC-UH
		as per clinical pathway. Clear fluids POD#1, Regular diet POD#2	
Activity			
Incl		Activity as Tolerated	LHSC-UH
		early ambulation. Post extubation up in chair.	
Vital Signs			
Incl		Vital Signs	LHSC-UH
		q1 hour. 2 day (Def)	
		daily	
		q1 hour.	
		q12 hours.	
		q2 hours.	
		q3 hours.	
		q30 days	
		q30 minutes	
		q4 hours.	
		q6 hours.	
		q8 hours.	
		weekly	
Incl		Vital Signs	LHSC-UH
		q4 hours. 1 day	
Incl		Vital Signs	LHSC-UH
		q8 hours.	
		Systolic Blood Pressure Target (mmHg)	LHSC-UH
Incl		Central Venous Pressure Target	LHSC-UH
		8-12 mmHg	
Patient Care			
Incl		Weight	LHSC-UH
		daily.	

Incl		Nasogastric/Orogastric Tube Insertion	LHSC-UH
		Low Intermittent Suction	
Incl		Intake and Output	LHSC-UH
		q1 hour. 1 day	
Incl		Intake and Output	LHSC-UH
		q4 hours. 1 day	
Incl		Intake and Output	LHSC-UH
		q12 hours.	
Incl		Surgical Drain to Collection Device	LHSC-UH
		Blake drain	
Incl		Discontinue Surgical Drain	LHSC-UH
		Other:, When: PostOp Day 4, Blake drain	
Incl		Drain/Tube Care	LHSC-UH
		Other:, Malecot	
		Comments - Remove POD #3	
		Discontinue Surgical Drain	LHSC-UH
		Other:, When: PostOp Day 3, Malecot drain	
Incl		Do Not Remove Dressing - Reinforce Only	LHSC-UH
		for 24 hours	
Incl		Dressing Change	LHSC-UH
		daily., POD #1	
Incl		POC Blood Gas Plus	LHSC-UH
		q6 hours. 24 hr	
		Comments - hemoglobin, lactate, electrolytes.	
Incl		POC Blood Glucose	LHSC-UH
		q6h 2 day	
Incl		POC Blood Glucose	LHSC-UH
		BID	
Incl		Discontinue Urinary Catheter	LHSC-UH
		POD#2	
Incl		Midline Catheter Insertion	LHSC-UH
Continuous Infusions			
		BLOOD TRANSFUSION - Albumin 25% (Alb 25%) - Product Only	LHSC-UH
		BLOOD TRANSFUSION - Albumin 5% (Alb 5%) - Product Only	LHSC-UH

		BLOOD TRANSFUSION - Hepatitis B Immune Globulin (HBIG) - Liver Transplant - Product Only	LHSC-UH
		dextrose 5%-sodium chloride 0.45%	LHSC-UH
		IV continuous, 100 mL/hr (Def)	
		IV continuous, 75 mL/hr	
		IV continuous, 125 mL/hr	
		Hepatic prophylaxis: Order for INR less than 2 (Note)	
		heparin 25,000 units in 250 mL dextrose 5% premix	LHSC-UH
		dextrose 5% premix diluent	
		IV continuous	
		heparin - additive	
		25,000 units, Every Bag, 100, unit/hr	
		alprostadil 500 mcg in 100 mL dextrose 5%	LHSC-UH
		dextrose 5% in water infusion	
		Titration Range: 0.1 - 0.5 mcg/kg/hr	
		Comments - Start 0.1 mcg/kg/hr and increase by 0.1 mcg/kg/hr to maximum 0.5 mcg/kg/hr; maintaining SBP greater than 90.	
		alprostadil - additive	
		500 mcg, 0.1, mcg/kg/hr	
Medications			
Incl		COMMON - Venous Thromboembolism (VTE) Prophylaxis (Module) (LHSC-UH, VC, PW, STEGH, TDMH)	LHSC-UH
Incl		CRIT CARE - Electrolyte Replacement (Module)	Facility Flexing Not Defined
Incl		Communication Order	LHSC-UH
		Do Not give Plasma, Platelets or Cryoprecipitate without discussing with the Liver Transplant Service.	
Incl		nystatin	LHSC-UH
		500,000 units, susp, SWISH+SWALLOW, q6 hours, for: 7 day	
Incl		acetylsalicylic acid	LHSC-UH
		81 mg, EC tab, ORAL, daily, Start: T+1;0800	
		Comments - Hold if platelets are less than 50	
Incl		pantoprazole injection	LHSC-UH
		40 mg, injection, IV, daily, infuse over 30 min	
		HEPATITIS B PROTOCOL (Note)	
		tenofovir	LHSC-UH
		300 mg, tab, ORAL, daily (Def)	
		300 mg, tab, ORAL, q72 hours	
Antimicrobials			

Incl		cefTRIAXone	LHSC-UH
		2 g, injection, IV, q24 hours, for: 48 hr	
Incl		metroNIDAZOLE	LHSC-UH
		500 mg, injection, IV, q12 hours, for: 48 hr	
Incl		fluconAZOLE	LHSC-UH
		100 mg, tab, ORAL, daily, for: 7 day	
		HIGH RISK recipients: Retransplant/More than 20 units PRBC during or including auto-transfusion/Renal failure with RRT/Fulminant hepatic failure/Previous fungal infection/Re-operation/Choledochojejunostomy/Choledochoduodenostomy/Early colonization of candida in peri-operative stage/MELD score above 30/Split, living donor/Early rejection/Mult-organ transplant (Note)	
		fluconAZOLE	LHSC-UH
		400 mg, tab, ORAL, daily, for: 4 week	
		Comments - HIGH RISK recipients: Retransplant/More than 20 units PRBC during or including auto-transfusion/Renal failure with RRT/Fulminant hepatic failure/Previous fungal infection/Re-operation/Choledochojejunostomy/Choledochoduodenostomy/Early colonization of candida in peri-operative stage/MELD score above 30/Split, living donor/Early rejection/Mult-organ transplant	
Immunosuppression			
		tacrolimus	LHSC-UH
		1 mg, cap, ORAL, q12 hours, Start: T+1;N	
		mycophenolate mofetil	LHSC-UH
		250 mg, cap, ORAL, q12 hours, Start: T+1;N	
		basiliximab	LHSC-UH
		20 mg, injection, IV, ONCE, infuse over 30 min, Start: T+4;N	
Corticosteroids			
Incl		TRANSPLANT - Liver Prednisone Taper (Module)	LHSC-UH
Antiviral Agents			
		CMV negative recipient/CMV positive donor/CMV positive recipient if recieving Thymoglobulin or Alemtuzumab (Note)	
		valGANciclovir	LHSC-UH
		900 mg, tab, ORAL, daily	
		ganciclovir	LHSC-UH
		5 mg/kg, injection, IV, q12 hours, infuse over 60 min	
		Comments - until negative test	
Laboratory			
Incl		LAB - HLA Donor Specific Antibody IgG (Module)	LHSC-UH

Incl		FK506 Level,Whole Blood (FK)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
Hematology			
Incl		Complete Blood Count (CBC)	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
Incl		Complete Blood Count (CBC)	LHSC-UH
		Routine, T+1;0300, Blood, Frequency: q12 hours. 2 times	
Incl		Complete Blood Count (CBC)	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 6 day	
		Comments - then re-assess	
Incl		INRPTT	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
Incl		INRPTT	LHSC-UH
		Routine, T+1;0300, Blood, Frequency: q12 hours. 2 times	
Incl		INRPTT	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 6 day	
		Comments - then re-assess	
Incl		Fibrinogen, Plasma (FIB)	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
Incl		Fibrinogen, Plasma (FIB)	LHSC-UH
		Routine, T+1;0300, Blood, Frequency: q12 hours. 2 times	
Incl		Fibrinogen, Plasma (FIB)	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 6 day	
General Chemistry			
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Creatinine (CRE)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Creatinine (CRE)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	

Incl		Urea (U)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Urea (U)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
Incl		Calcium,Serum,Plasma (CA)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Calcium,Serum,Plasma (CA)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Phosphate (PHO)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Phosphate (PHO)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
Incl		Glucose,Random (GLUR)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Glucose,Random (GLUR)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Lactate,Plasma (LACP)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Lactate,Plasma (LACP)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: q48 hours 2 times	
Liver Function/Enzymes			
Incl		Bilirubin,Direct (BILD)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Bilirubin,Direct (BILD)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
Incl		Bilirubin,Total (BILT)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	

Incl		Bilirubin,Total (BILT)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
		Aspartate Aminotransferase (AST)	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
		Aspartate Aminotransferase (AST)	LHSC-UH
		Timed, T+1;0300, Blood, Frequency: q12 hours. 2 times	
		Aspartate Aminotransferase (AST)	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
		Alanine Aminotransferase (ALT)	LHSC-UH
		Timed, T+1;0300, Blood, Frequency: q12 hours. 2 times	
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		Now, T;N, Blood, Frequency: q6 hours. 3 times	
		Alkaline Phosphatase (ALP)	LHSC-UH
		Timed, T+1;0300, Blood, Frequency: q12 hours. 2 times	
Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		AM Routine, T+2;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Incl		Albumin,Serum,Plasma (ALB)	LHSC-UH
		Now, T;N, Blood, Frequency: q12 hours. 2 times	
Incl		Albumin,Serum,Plasma (ALB)	LHSC-UH
		AM Routine, T+1;0300, Blood, Frequency: daily. 7 day	
		Comments - then re-assess	
Other			
		Hepatitis B Surface Antigen (HpBsAg)	LHSC-UH
		AM Routine, T+5;0300, Blood	
		Hepatitis C RNA Quantitative - Viral Load (HpCRNAQ)	LHSC-UH
		AM Routine, T+5;0300, Blood	

		Comments - Must fill in public health requisition that is available in the transplant unit.	
		HIV Viral Load (HIVLOAD)	LHSC-UH
		AM Routine, T+5;0300, Blood	
Diagnostic Imaging			
Ultrasound			
Incl		US Liver Transplant	LHSC-UH
		Routine, T+1;N	
Consults			
		Standard Risk (Note)	
		Consult to Physician	LHSC-UH
		Service: Infectious Disease-Day Team University, Reason: Liver transplant standard risk, Priority: ASAP (Provider must call), Action: Consult & Implement Orders	
		Increased Risk Donor (Note)	
		Consult to Physician	LHSC-UH
		Service: Infectious Disease-Day Team University, Reason: Increased Risk donor, liver transplant, Priority: ASAP (Provider must call), Action: Consult & Implement Orders	
Allied Health			
Incl		Physiotherapy Referral	LHSC-UH
		Routine, transplant patient	
Incl		Social Work Referral	LHSC-UH
		Other, Liver transplant	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH

Table 5: Transplant Liver Post-Operative Outpatient Labs

Laboratory			
		LAB - HLA Donor Specific Antibody IgG (Module)	LHSC-UH
Incl		Magnesium,Serum,Plasma (MG)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		Glucose,Random (GLUR)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
		TSH (3rd Generation),Serum (TSH)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
		FK506 Level,Whole Blood (FK)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
		Sirolimus Level, Whole Blood (SIR)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
		Cyclosporine Level,Whole Blood (CYA)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
		Quantitative Cytomegalovirus (QCMV)	LHSC-UH
		STAT T;N, Frequency: ONCE	
		Hepatitis B Screen (HpBpanel)	LHSC-UH
		STAT, T;N, Blood	
		Hepatitis C RNA Quantitative - Viral Load (HpCRNAQ)	LHSC-UH
		STAT, T;N, Blood	
Hematology			
Incl		Complete Blood Count and Differential (CBCD)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		INR - International Normalised Ratio	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
General Chemistry			
Incl		Electrolytes,Serum,Plasma (LYTE)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		Creatinine (CRE)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Liver Function/Enzymes			
		Aspartate Aminotransferase (AST)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	

Incl		Alkaline Phosphatase (ALP)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		Alanine Aminotransferase (ALT)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		Bilirubin,Direct (BILD)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Incl		Bilirubin,Total (BILT)	LHSC-UH
		STAT, T;N, Blood, Frequency: ONCE	
Legend:			
Incl		This orderable is prechecked but can be unchecked	
	Pers	This is a persistent note	
	Req	This orderable is required and can NOT be unchecked	
		London Health Sciences - University Hospital	LHSC-UH