Table S1. MEDLINE Search strategy

1	organ transplantation/ or heart transplantation/ or kidney transplantation/ or liver transplantation/ or lung transplantation/
2	((organ or heart or kidney or renal or liver or lung) adj transplant*).tw.
3	1 or 2
4	"Outcome Assessment (Healthcare)"/
5	"Process Assessment (Healthcare)"/
6	"Outcome and Process Assessment (Healthcare)"/
7	Health Status Indicators/
8	"Quality of Life"/
9	"Quality of Healthcare"/
10	Quality Indicators, Healthcare/
11	Patient satisfaction/
12	Health Status/
13	patient outcome assessment/
14	Quality Assurance, Healthcare/
15	Quality Improvement/
16	quality.tw.
17	patient satisfaction.tw.
18	(clinical adj2 indicator).tw.
19	4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18
20	**3 and 19**

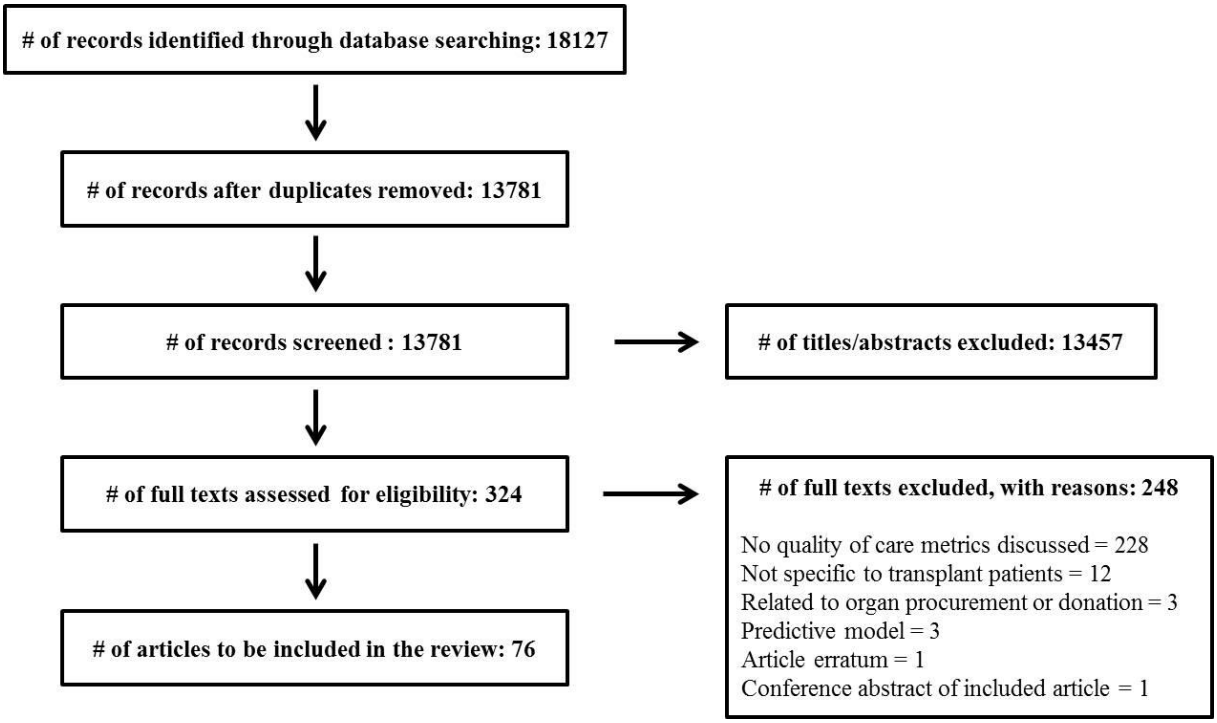


Figure S1. PRISMA flow diagram of study selection, including the reasons for excluding the full text articles.

Table S2. Characteristics of Included Studies

2A. Characteristics of the observational or experimental studies: Patient Focused studies with 1 group

First Author, Year, Country	Article Type	Organ(s)	Inclusion criteria	Exclusion criteria	Sample Size, Sex, and Age
Adams 2013, USA [1]	Observational, Cohort/ retrospective*	Heart	Group of patients in the first year of transition from young adult to adult centered transplant programs	NR	N= 12, % male= NR, Age= 24 (median)
Amer 2014, USA [2]	Observational, Cohort/ retrospective*	Kidney	All de novo solitary kidney transplant recipients	NR	N= 607, % male= 58, Age= 52 +/- 14
Chandrasekaran 2016, USA [3]	Observational, Cross-Sectional	Kidney	Patients who visited an outpatient transplant clinic for postoperative care between Oct 2014 and July 2015.	Patients who underwent multi-visceral transplants	N=77, % male= 56, Age= 51
Choi 2016, S. Korea [4]	Observational, Cohort/ retrospective*	Liver	Patients who underwent a liver transplantation between July 2014 and January 2016.	NR	N=13, % male= NR, Age= NR
De Simone 2005, Italy [5]	Observational, Cohort/ retrospective	Liver	All United Network for Organ Sharing (UNOS) 3 patients referred between January 1, 1996 and October 1, 2004, and whose clinical data were stored in a prospectively maintained nurse database.	UNOS status 1, 2a, and 2b patients	N= 1837, % male= NR, Age= NR
Dickson 2016, USA [6]	Report on a quality improvement initiative*	Kidney	New kidney transplants between August 2012 and July 2015	NR	N=106, % male= NR, Age= NR
Irwin 2016, USA [7]	Observational, Cohort/ retrospective	Kidney; Liver; Heart; Lung; Pancreas	All adult and pediatric cases with case effective dates (CED) between 01/01/2010 and 30/04/2014 and claims paid through 30/09/2014. Kidney, liver, heart, lung, pancreas, kidney/liver, and kidney/pancreas referrals were included. Re-transplants were included, but flagged for the same patient as an outcome.	Patients with an invalid CED in notification data, members without medical coverage through the Payer and members whose transplant case dates do not have a matching inpatient admission claim	N= 18453, % male= NR, Age= NR
King 2015, USA [8]	Observational, Cohort/ retrospective*	Kidney	Medicare primary, adult kidney-only transplant recipients from January 1, 2000 through November 31, 2011	NR	N= 46850, % male= NR, Age= NR
Lubetzky 2015, M [9]	Observational, Cohort/ retrospective*	Kidney	Adult, kidney-only transplant recipients	Cases with graft failure or death during transplant hospitalization	N= 381, % male= NR, Age= NR

First Author, Year, Country	Article Type	Organ(s)	Inclusion criteria	Exclusion criteria	Sample Size, Sex, and Age
McCandless 2013, USA [10]	Observational, Cohort/ retrospective*	Heart	Patients in the Pediatric Health information system (PHIS) database who had heart transplants from 2000 to 2008	NR	N= 633 (8581 readmissions), % male= NR, Age= NR
Moghadamyeghaneh 2016, USA † [11]	Observational, Cohort/ retrospective*	Kidney	Patients who underwent kidney transplant	NR	N= 172 586, % male=NR, Age= NR
Moghadamyeghaneh 2016, USA † [12]	Observational, Cohort/ retrospective*	Kidney	Patients who underwent kidney transplant	NR	N= 172 586, % male=NR, Age= NR
Santana 2011, North America [13]	Observational, Cross-sectional*	Lung	Consecutive pre and posttransplant patients attending the lung transplant outpatient clinic in a tertiary institution	NR	N= 213 (105 pre and 108 posttransplant), % male= 50, Age= 53
Srinivas 2012, USA [14]	Observational, Cross-sectional*	Kidney	Adult solitary kidney transplant recipients (2003- 2007) for primary pay Medicare recipients	NR	N= 39088, % male= NR, Age= NR
Stiavetti 2010, Italy [15]	Observational, Cross-sectional	Liver	Age 18 years or older; liver transplant recipients discharged from their unit after de novo transplantation, whether they were to return home or be transferred to another care service in or outside of our hospital; and Italian native speaker capable of understanding the objectives of the research project.	NR	N= 51, % male= 76, Age= 26% of participants ranged 51- 60
Sultan 2013, Canada [16]	Observational, Cohort/ retrospective	Kidney	All adult patients referred for kidney transplantation at Toronto General Hospital (TGH) Jan 1, 2003 to Dec 31, 2011 and followed up until Dec 31, 2012. Patients eventually placed on the kidney/pancreas waiting list were also included.	Patients transferred from other hospitals if they were already transplanted elsewhere and were referred to TGH only for posttransplant follow up care	N= 2290 (2316 referrals), % male= 62, Age= 15% (18-34); 17% (35-44); 27% (45-54), 25% (55-64), 15% (65+)
Taber 2013, USA [17]	Report on a quality improvement initiative	Kidney	All adult kidney transplant recipients transplanted between June 2006 and July 2009.	Patients younger than 18 years of age and recipients of multi-organ transplants.	N= 476, % male= 63, Age= 51 (SD = 14)
Tavares 2016, Brazil [18]	Observational, Cohort/retrospective*	Kidney	All renal only transplant recipients performed between Jan-Dec 2012 in a single center, with complete data.	NR	N=555, % male= 63, Age= 49

*Conference abstract
† Identical abstracts published in two separate journals. Data compiled and reported only once.

2B. Characteristics of the observational or experimental studies: Patient Focused studies with two groups

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	Group 1: Name, Sample Size, Sex, and Age	Group 2: Name, Sample Size, Sex, and Age
Birkmeyer 2001, USA [19]	Observational, Cohort/ prospective	Kidney	Patients undergoing general surgery between Sept 1, 1998 and March 31, 2000. Subgroup analysis, patients sorted by their primary procedure. Specifically looked at the Renal transplant patients.	Inability to link postoperative outcomes with a primary general surgical procedure	Patients with unplanned reoperations N= 10, % male= NR, Age= NR	Patients without unplanned reoperations N= 38, % male= NR, Age= NR
Carbone 2016, Italy and the United Kingdom [20]	Observational, Cohort/ retrospective	Liver	Patients in the Italian 'Liver match' database, and the 'UK transplant' registry.	Patients who underwent multi-organ transplantation, retransplantation, liver transplant from fulminant hepatitis and the few with missing survival data	United Kingdom (DBD and DCD), N (DBD)= 741; (DCD)= 144, % male (DBD)= 65.1; (DCD)= 76.4, Age (DBD)= 54 (median), (DCD) = 54(median)	Italy N=1435, % male= 79.1, Age= 55 (median)
Dube 2013 USA † [21]	Observational, Cohort/ retrospective*	Kidney	Adult kidney transplant recipients transplanted from 1/1/10-12/31/11. All patients received similar immunosuppression.	NR	Early Hospital Readmission (EHR) group N= 123, % male= 60.2, Age= 53.1	Non-EHR N= 329, % male= 65.6, Age= 51.1
Dube 2013 USA † [22]	Observational, Cohort/ retrospective*	Kidney	All adult kidney transplant recipients transplanted from 1/1/10-12/31/11. All patients received similar immunosuppression.	NR	EHR (early hospital readmission) N= 123, % male= 60.2, Age= 51	Non-EHR N= 329, % male= 65.6, Age= 53
Formica 2012, USA [23]	Experimental, Controlled before-and-after study. Quality improvement initiative	Kidney	All patients referred to the transplant center from July 1, 2007 to Jan. 31, 2010.	Outpatient encounters were excluded if care took place in the emergency department or ambulatory surgery, or the principal diagnosis was not kidney or urinary system related.	Conventional Group N= 378, % male= 56, Age= 49.6 ± 13.9 (initial evaluation); 50.3 ± 14.0 (listing for transplant)	1-Day Center-coordinated group N= 527, % male= 63, Age= 49.6 ± 13.9 (initial evaluation), 50.3 ± 14 (listing for transplant)
Harhay 2013, USA [24]	Observational, Cohort/ retrospective	Kidney	All adults undergoing kidney transplant at the University of Pennsylvania from Jan. 1, 2003 to Dec. 31, 2007	Multi-organ transplant recipients and recipients who died prior to discharge from kidney transplant	Not rehospitalized N= 516, % male= 65, Age= 51.95 ± 13.4	Rehospitalized N= 237, % male= 61, Age= 50.61 ± 13.1

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	Group 1: Name, Sample Size, Sex, and Age	Group 2: Name, Sample Size, Sex, and Age
Hullin 2016, Switzerland [25]	Report on a quality improvement initiative*	Heart	Participants who underwent heart transplant at the University hospital of Lausanne between 2000 and 2014	NR	Cohort transplanted between 2000-2007 N=66, % male= 80, Age= 53	Cohort transplanted between 2008 – 2014 N= 74, % male=80, Age= 53
Li 2016, USA [26]	Report on a quality improvement initiative	Kidney	All percutaneous renal transplant biopsies that were performed for renal allograft patients in the 24 months before and 18 months after implementation of the protocol for complications at a single center in California.	NR	Before Implementation of Protocol N=502, % male= 60, Age= 50	After Implementation of Protocol N=378, % male= 63%, Age=13
Lubetzky 2016, USA [27]	Observational, Cohort/ retrospective	Kidney	Consecutive adult living and deceased donor kidney only recipients at Montefiore Medical Center between October 2011 and April 2015	Patients who died within 30 days of discharge and graft failures during the index hospitalization	No Readmission N= 317, % male= 59.3, Age= 53.8 ± 13.2	Readmission N= 145, % male= 62.1, Age= 53.4 ± 13.5
McCormack 2001, Argentina [28]	Observational, Cohort/ retrospective*	Liver	All patients that underwent liver transplant in their unit between Sept 2006 and Dec 2010	NR	Transplanted without the need of I-RBC transfusion N= 36, % male= NR, Age= NR	Transplanted using I-RBC N= 74, % male= NR, Age= NR
Noon 2016, USA [29]	Report on a quality improvement initiative*	Kidney	Kidney transplant patients who were either in the Telehealth Kidney Program (2014) or not (2013 or before)	NR	Telehealth Kidney Program N=57, % male= NR, Age= NR	Control Group N=67, % male= NR, Age= NR
Palumbo 2013, USA [30]	Observational, Case control/ retrospective*	Kidney	Adult kidney transplant patients at a large university hospital between July 2010 and June 2012	Patients who had multi organ transplants, died or lost their graft prior to discharge, or were discharged to another facility	Patients with readmission within 30 days N= 113, % male= NR, Age= NR	Patients without readmission within 30 days N= 201, % male= NR, Age= NR
Osho 2016, USA [31]	Observational, Cohort/ retrospective	Lung	Receipt of lung allografts before March 2012, with availability of demographic and outcome data.	Re-transplantation, multi-organ transplantation, and in-hospital death during the initial hospitalization. If readmission was planned	No readmission N= 434, % male= 61.8, Age= 53	Readmission N=361, % male= 56.6, Age=15

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	Group 1: Name, Sample Size, Sex, and Age	Group 2: Name, Sample Size, Sex, and Age
				as part of postoperative management		
Russo 2016, USA [32]	Experimental, Controlled before-and-after study. Quality improvement initiative	Liver	Adult primary liver transplants using deceased donor grafts (whole and split liver transplants), and donors after brain death and donors after circulatory death.	Multi-organ transplants and re-transplants	Pre-protocol N=121, % male= NR, age= 53 (range 22-73).	Post-protocol N=46, % male= NR, age= 56 (range 21-68).
Schwarzbach 2010, Germany [33]	Experimental, Controlled before-and-after study. Quality improvement initiative	Kidney	All patients who underwent either deceased or living donor kidney transplant at their institution between January 1, 2005 and August 31, 2007.	NR	Clinical pathway - operated after Jul 1, 2007 N= 32, % male= 63, Age= 55.5	Control - operated before July 1, 2007 N= 44, % male= 65.9, Age= 48.9
Thomas 2011, Germany [34]	Observational, Cohort/ retrospective*	Kidney	Consecutive kidney transplant procedures from postmortal donation in 2010 were analyzed	NR	HANDS-ON: trainee had the active operative role N= NR, % male= NR, Age= NR	WATCH: the trainee was helping the senior surgeon N= NR, % male= NR, Age= NR

*Conference abstract
† Two conference abstracts based on the same data set, but with individual aims/purpose

2C. Characteristics of the observational or experimental studies: Patient Focused studies with three or more groups

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	Group 1- Name, Sample size, age and sex	Group 2- Name, Sample size, age and sex	Group 3- Name, Sample size, age and sex	Group 4- Name, Sample size, age and sex	Group 5- Name, Sample size, age and sex
Mollberg 2016, USA [35]	Observational, Cohort/ retrospective	Lung	All patients undergoing single or bilateral lung transplant Jan. 1, 2004, and Dec. 31, 2013	Patients with initial lung transplantation at an outside institution who underwent a second lung transplant at the study institution,	Readmission within 30 days, N=129, % male= 63%, Age=52	Readmission within 1 year, N=276, % male= 54, Age= 53	No readmission, N=136, % male= 63, Age= 50		

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	Group 1- Name, Sample size, age and sex	Group 2- Name, Sample size, age and sex	Group 3- Name, Sample size, age and sex	Group 4- Name, Sample size, age and sex	Group 5- Name, Sample size, age and sex
				and patients < 18 years old.					
Prakash 2010, USA [36]	Observational, Cohort/ retrospective	Kidney	Patients between the ages of 18 and 100 years, were either black or white, and initiated renal replacement therapy between January 2005 and October 2006.	Patients whose residential zip code listed in USRDS did not match a zip code tabulation area in the 2000 U.S. Census and those who were missing information on receipt of nephrology care before initiation of renal replacement therapy	< 5% Black Residents in Zip Code, N= 41126, % male= 58.3, Age= 66	5 - 14.9% Black Residents in Zip Code, N= 17257, % male= 56.59, Age= 64	15 - 24.9% Black Residents in Zip Code, N= 8170, % male= 54.09, Age= 62	25 - 49.9% Black Residents in Zip Code, N= 11443, % male= 51.97, Age= 61	>50% Black Residents in Zip Code, N= 14004, % male= 49.36, Age= 60
Sclair 2016, USA [37]	Observational, Cohort/ retrospective	Liver	100 consecutive patients with cirrhosis at the three sites between Oct 1, 2010 and Mar 31, 2011, age ≥18 years, and at least 1 additional hepatology encounter.	HIV+, patients who received a liver transplant prior to the query date, patients where diagnosis of cirrhosis could not be confirmed.	Safety-net site N=81, % male= 52, age= 57	Faculty practice site N=85, % male= 51, age= 61	Veterans affairs site N=76, % male= 100, age= 61		
Thomas 2013, Germany [38]	Observational, Cohort/ retrospective	Kidney	Consecutive deceased donor kidney transplant procedures performed between January 2010 and November 2012	NR	Trainees, N= 33, % male= 58, Age= 60 (34-75)	Low experience, N= 76, % male= 59, Age= 54 (25-75)	Medium experience, N= 30, % male= 69, Age= 64 (29-74)	High experience, N= 45, % male= 69, Age= 57 (22-76)	

*Conference abstract

2D. Characteristics of the observational or experimental studies: Transplant Center focused studies

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	# of Centers	Groups - Name, Number of Centers
Chakrabarti 2016, USA [39]	Observational, cross-sectional	Kidney	Transplant centers with available SRTR data, HCAHPS survey data, and AHA structural data	Hospitals with isolated pediatric kidney transplant programs, or hospitals with missing HCAHPS or AHA/structural data	200	1) Quintile 1 "highest transplant center performance"; n=NR 2) Quintile 3 "average transplant center performance"; n=NR 3) Quintile 5 "lowest transplant performance "; n=NR
Cramm 2016, USA and Canada [40]	Observational, Cohort/ retrospective	Liver	All children (<18 years) undergoing a primary liver transplantation at transplant centres with 50 cases or more reported in SPLIT registry from 1995 to 2009	Patients with missing data for one or more of the factors included in the risk adjusted models.	21	1) Low mortality tertile, N= NR 2) Medium mortality tertile, N= NR 3) High mortality tertile, N= NR
Czerwinski 2016, Poland [41]	Observational, cohort/ retrospective	Kidney, Liver, Heart, Lung, Kidney/ Pancreas	Patients who underwent organ transplantations between 1998 and 2014 in Poland.	NR	NR	No groups
Hayanga 2016, USA [42]	Observational, Cohort/ retrospective	Lung	Adult primary lung transplant recipients who underwent lung between the years of 2005 and 2013	Recipients listed for multiple organs or redo lung transplant	72	1) Annual Center volume <20 lung transplants/year, N= 41 centers 2) Annual Center volume 21-29 lung transplants/year, N= 12 centers 3) Annual Center volume 30-39 lung transplants/year, N= 10 centers 4) Annual Center volume >/= 40 lung transplants/year, N= 9 centers
Nijboer 2016, Germany [43]	Observational, cohort/ retrospective	Liver	Liver transplant centers in Germany	NR	24	No groups
Patzer 2014, USA [44]	Protocol, cluster randomized controlled trial	Kidney	All dialysis facilities within Georgia; the presence of a racial disparitiy in transplant referral; crude annual referral in the lowest 50th percentile	Facilities with a 2012 population of < 25 patients (18-69 years of age)	283	1) Pool of dialysis facilities randomized for intervention, N=134 2) Remaining dialysis facilities in Georgia not selected for randomization, N=149

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	# of Centers	Groups - Name, Number of Centers
Planting a 2016, USA [45]	Observational, cohort/ retrospective	Kidney	Georgia state patients, age 18-69 years who initiated dialysis therapy from Jan. 1, 2005 through Sept. 30, 2011	Patients who initiated dialysis therapy before July 1, 2005; facilities that did not have DFR data or at least 11 patients. Patients treated at transplantation-only or Veterans Affairs dialysis facilities, or who received ESRD therapy for less than 90 days.	241	1) Low Referral Rate, N=121 2) High Referral Rate, N=120,
Rochon 2013, USA [46]	Observational, Cross-sectional*	Liver	NR	NR	NR	1) High volume centers (>85 cases per year), N= NR 2) Low volume centers, N= NR
Salkowski 2016, USA [47]	Observational, cohort/ retrospective	Multiple: kidney, heart, lung	For program-specific reports: All kidney, liver, heart and lung transplants between Jan 1, 2012 and Dec 31, 2014 For analysis: all outcome data contained in SRTR program specific reports for June 2015 and Dec. 2015	Transplants performed between July 1, 2014 and Dec. 31, 2014 were not included in the June 2015 cohort. Pancreas and intestine transplant programs.	545	1) High organ/volume (>10) and good performance 2) High organ/volume (>10) and low performance 3) Low organ/volume (<10) and good performance 4) Low organ/volume (<10) and low performance N = varied by each organ
Schold 2016, USA [48]	Observational, cohort/ retrospective	Kidney	Adult (18+) Candidates placed on the waitlist for solitary kidney transplant from 1995 to 2014 with follow-up on the waiting list between 2007 and 2014.	Patients placed on the waitlist prior to 1995, patients listed at center that did not continue to perform transplants throughout the study period and that had less than 30 candidates over the study period.	202	1) No low performance evaluation, N=145 2) Low performance evaluation, N=57
Schold 2016 [49]	Observational, cohort/ retrospective	Kidney	US adult kidney transplant programs with >/= 10 transplants	"small" programs (<10 transplants per 2.5 years)	188	No groups
Srinivas 2015, USA [50]	Observational, Cross-sectional	Kidney	All transplant centers that performed at least 1 kidney transplant in the United States in 2011 were initially included in the analysis.	Veterans Administration hospitals, military hospitals, pediatric hospitals, those not reporting within Hospital Compare, those with missing	188	1) Above Median Observed/Expected 1-month graft loss or death, N= NR 2) Below Median Observed/Expected 1-month graft loss or death, N= NR 3) Above Median Observed/Expected 1-Year graft loss or death, N= NR

First Author, Year, Country	Article type	Organ(s)	Inclusion criteria	Exclusion criteria	# of Centers	Groups - Name, Number of Centers
				HCAHPS data, and 1 hospital in Puerto Rico		4) Below Median Observed/Expected 1-Year graft loss or death, N= NR
Taber 2014. USA [51]	Observational, Cross-sectional*	Liver	Cohort of US liver transplant programs	NR	68	1) High Peri-operative quality centers, N= 34 2) Low Peri-Operative quality centers, N= 34
Taber 2014, USA [52]	Observational, Cohort/ retrospective	Kidney	Kidney transplants performed in the US in 2011 at 1 of the centers that participates in University HealthSystem Consortium (UHC)	NR	94	1) Top 3 quartile transplantation centers, N= 69 2) Bottom Quartile transplantation centers, N= 24
Tsao 2011, Taiwan [53]	Observational, Cohort/ retrospective	Kidney	Patients with a confirmed diagnosis of ESRD who received a kidney transplant between January 1, 1996 and December 31, 2003.	Patients younger than 18 years and those receiving a second transplant	29	1) Low-surgical-volume hospitals, N= 23 2) High-surgical-volume hospitals, N= 6
Woodle 2013, USA [54]	Observational, Cross-sectional*	Kidney	SRTR center-specific data for fiscal year 2011 for US adult kidney transplant programs	NR	202	1) US Adult Kidney Transplant Programs, N= 202

*Conference abstract

2E. Characteristics of the included studies: Reports, Editorials, Consensus Documents, Reviews

First Author, Year, Country	Article type	Organ(s) of interest	Aim or purpose of the article
Adler 2016, USA [55]	Review	Kidney, Liver	To explore how well-intentioned but conflicting policy decisions (allocation policy vs. transplant program evaluation) result in unanticipated challenges in transplant care.
Cabello 1998, USA [56]	Report on a quality improvement initiative	Liver	To present the planning, implementation and evaluation of their interdisciplinary clinical pathway program for liver transplant
Davies 2012, USA [57]	Narrative review	Heart	Reviews the extent to which large data sets have been used for quality assessment and improvement in pediatric heart transplantation, the pitfalls in interpreting publications based on these data sets, and the potential of these data sets have to improve pediatric heart transplantation moving forward.
Emond 2016, USA [58]	Editorial	Liver	To review and comment on an article discussing the reasons why acceptance of organ offers is a necessary performance metric for liver transplant centers
Li 2016, Canada [26]	Narrative review	Kidney; Liver; Combined kidney-pancreas	Summarize the literature on hospital readmissions in the early posttransplant period in abdominal organ transplant recipients, focusing on the incidence, causes, risk factors, outcomes, and costs of hospital readmission.

First Author, Year, Country	Article type	Organ(s) of interest	Aim or purpose of the article
Kettelhut 2010, USA [59]	Narrative review	Liver; Small bowel; multi-visceral	Goals of the article: 1) provide framework for risk factors associated with surgical site infections in liver, small bowel and multi-visceral transplant recipients; 2) review general principles of appropriate antimicrobial prophylaxis; 3) provide a framework for developing an antibiotic prophylaxis protocol in liver, small-bowel and multivisceral transplant surgery; 4) develop an approach to further quality improvements in transplant surgical quality
Khanna 2010, USA [60]	Report on a quality assurance and performance improvement plan (QAPI)*	Liver	Development and implementation of a liver transplant QAPI process and evaluation of its impact on program performance.
MacPhee 2012, United Kingdom [61]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2010.
Mathur 2016, USA [62]	Narrative review	Liver	To discuss quality metrics in the field of transplantation and to propose including quality metrics reflecting pretransplant evaluation.
McElroy 2016, USA [63]	Editorial	Unspecified	A discussion of how various emergency department care measurements could be used to help improve early readmission rates in transplant patients by identifying areas for improvement.
Pestana 2016, Brazil [64]	Program evaluation	Kidney, Kidney/pancreas	To describe this medical model in detail and the results obtained over the last 18 years, aware that it could be applied in other clinical situations of health assistance, as well as in other regions.
Pruthi 2013, United Kingdom [65]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2011.
Pruthi 2013, United Kingdom [66]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2012.
Pruthi 2015, United Kingdom [67]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2013.
Ravanan 2009, United Kingdom [68]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the Directorate of Organ Donation and Transplantation within NHS Blood and Transplant (NHSBT), and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2007.
Rela 2016, India [69]	Editorial	Liver	An opinion piece discussing the merits of using "failure to rescue" as a quality metric in pediatric liver transplantation.
Roussel 2013, USA [70]	Report on a quality improvement initiative	Heart	An overview of the development of regular multidisciplinary rounds at a transplant centre
Spanish Society of Liver Transplantation	Consensus Report on quality indicators	Liver	Summarize the conclusions reached during the 2nd Consensus Meeting organized by the Spanish Society of Liver Transplantation in 2008. Access and priority criteria for the waiting list were updated, a set of key questions for children's transplant programs was addressed, and

First Author, Year, Country	Article type	Organ(s) of interest	Aim or purpose of the article
[Sociedad Espanola de Trasplante Hepatico], 2009, Spain [71]			advances were made in implementing quality measurement systems for liver transplant programs.
Therapondos 2013, USA [72]	Report on a quality assurance and performance improvement plan (QAPI)	Liver	Present the results of their quality assurance and performance improvement plan that was initiated to improve outcomes after their program/clinic had lower than expected patient and graft survival rates and was placed under peer review
Toussaint 2015, Australia [73]	Observational, Cohort/ prospective	Kidney	To summarize the implementation of the renal key performance indicators and subsequent trends in clinical practice across renal services
Webb 2010, United Kingdom [74]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2008.
Webb 2010, United Kingdom [75]	Annual Report and Analysis	Kidney	Analysis or renal transplant activity and survival data from the NHSBT, and analysis of demographics, clinical, and biochemical variables in renal transplant recipients from the 23 centres in the UK Renal Registry in 2009.

*Conference abstract

Table S3. Metrics with insufficient definitions and details

Metric	Organ Type(s)	Proposed method and timing of measurement	Period of Care	Metric Type, Domain of Quality
Accuracy of reporting to AQUA[43]	Liver	Database	Program	Process, unclear
Audit results [43]	Liver	NR	Program	Process, unclear
QAPI [39]	Kidney	NR	Program	Unclear
Provider/Staff Satisfaction [39]	Kidney	NR	Program	Unclear
Pre transplant visit [60]	Liver	Database	Referral and Wait-Listing	Structure, Access
Post transplant visit [60]	Liver	Database	Long-term Follow-up	Structure, Access
Multiple listing consent [60]	Liver	Database	Referral and Wait-Listing	Structure, Access
Completeness of patient acknowledgement and hepatocellular cancer justification forms [60]	Liver	Database	Referral and Wait-Listing	Process, Patient-Centered
Pre-listing 2 ABO blood types [60]	Liver	Database	Referral and Wait-Listing	Process, Safety
ABO verification [60]	Liver	Database	Referral and Wait-Listing	Process, Safety
Transfusion Requirement [60]	Liver	Database	Inpatient Transplant Surgery	Process, Safety
Percent ABO form [70]	Heart	Dashboard	Unclear	Process?, Safety?
Emergency department visits and hospitalization [1]	Heart	Patient charts	Long-term Follow-up	Outcome, Safety
Stable allomap scores and IS levels [1]	Heart	Patient charts	Long-term Follow-up	Outcome, Safety
Percent of patients on dialysis [70]	Heart	Dashboard	Unclear	Outcome?, Safety?
Expired cases [70]	Heart	Dashboard	Unclear	Outcome?, Safety?
Graft Rejection – general [60]	Liver	NR	Long-term Follow-up	Outcome, Safety
Informed consent Percentage [70]	Heart	Dashboard	Inpatient Transplant Surgery	Process, Patient-centered
Complication rates – post transplant [39,49,70]	Heart, Liver, Kidney	Dashboard	Long-term Follow-up	Outcome, Safety
In hospital complications [51]	Liver	Database	Inpatient Transplant Surgery	Outcome, Safety
Complication rates – unspecified [69]	Liver	NR	Unclear	Outcome, Safety
In hospital safety events [51]	Liver	Database	Inpatient Transplant Surgery	Outcome, Safety
Cost-effective resource utilization [39]	Kidney	NR	Program	Structure, Efficiency
Percentage of non-US patients transplanted [72]	Liver	Dashboard; most recent 12 months	Program	Structure, Equitable
Outpatient prescription volume* [6]	Kidney	Every 6 months	Program	Process, Safety
Communication with providers [39]	Kidney	NR	Program	Outcome, Patient-centered

Table S4. Summary of the process or methodology reported for selecting quality metrics

Reference	Details of the Process	Quality metrics
Sociedad Espanola de Trasplante Hepatico, 2009 [71]	The Spanish Society of Liver Transplantation held a consensus seminar to ensure continuous improvement of quality and results in liver transplantation. The seminar was divided into 2 workings groups made up of professionals. One group was in charge of developing a set of quality indicators that can be monitored to provide periodic measurement and evaluation of pertinent aspects of the service provided. This consisted of developing a set of relative indicators for the units, defining them and standardizing them. A second seminar was used by professionals to select indicators with the desired degree of reliability, validity and precision. Indicators were subjected to a pilot study and critical analysis by an improvement task force.	Efficient patient evaluation Rate of refused organs Patient satisfaction Perioperatory mortality Primary non-function Early retransplantation rate Unplanned return to the operating room 30-day mortality Cardiovascular risk factor detection & treatment Patient survival Late retransplantation rate
Sclair 2016 [37]	Quality indicators were selected from the set of quality indicators for cirrhosis care developed by Kanwal et al. in 2010.[76] Methods used by Kanwal et al.: 1) Review existing clinical guidelines to establish a taxonomy of candidate quality indicators. 2) Review the literature linking the quality indicators to clinically important outcomes; grading of the evidence. 3) Selection of expert panel (11 gastroenterologists) to review the quality indicators. 4) Modified RAND/UCLA process to rate the appropriateness of each quality indicator. 5)Face-to-face meeting to focus on disagreements, identifying additional quality indicators, modifying definitions, and deleting problematic or irrelevant metrics; followed by re-rating the metrics. 6) Post-hoc analysis: panelists re-rate the importance of the metrics, where importance was defined as the magnitude of health benefit derived from the performing the indicated process.	Transplantation discussion MELD score documentation
Toussaint 2015 [73]	Working Group was established to develop key performance indicators that would enable each unit to determine its performance against best practice parameters. The working group met six times in 2011, and after extensive consultation and discussion, six indicators were selected (2 transplant specific indicators), which were endorsed by the Renal Health Clinical Network leadership group. Indicator targets were initially adopted using established criteria or agreed performance levels, but required numerous revisions and iterations in response to problems with interpretations by renal health services. After 12 months of data collection and multiple changes to/ clarification of definitions, the data appeared accurate and auditable. The indicator working group continued to meet regularly and was responsible for quarterly analysis, ensuring the indicators remained accurate, meaningful and relevant.	Timely listing of patients for deceased donor transplantation Proportion of patients with pre-emptive renal transplantation
Taber 2014 [52]	Aim of the study was to determine the association between perioperative quality metrics and patient/graft outcomes with the goal of developing a composite kidney transplantation quality index. No rationale provided for the selection of their initial set of quality metrics, which were compared to rates of inadequate center performance reported by the SRTR. The means of the quality measures that revealed significant associations ($p<0.05$) (ICU days, EHR, and in-hospital complications or safety events) were used to develop the composite quality metric.	Composite peri-operative quality metric (ICU length of stay, length of stay, in hospital mortality, inpatient complications, safety events, EHR)
Patzer, 2014 [44]	The Southeastern Kidney Transplant Coalition was formed with a mission of improving equity in access to kidney transplantation for end-stage renal disease (ESRD) patients. This group consists of voluntary stakeholders in the ESRD community: ESRD patients, dialysis facilities,	Time to transplant referral New patient referrals Referrals by race

	transplant centers, social workers, organ procurement organizations, healthcare providers, academic researchers, patient advocacy groups, and ESRD Network 6 staff. A population needs assessment was performed by coalition members, the results of which helped the members develop a multicomponent, quality improvement intervention to deliver among dialysis facilities in order to reduce racial disparities in access to kidney transplantation. (This article is the protocol for the study: Reducing Disparities In Access to Kidney Transplantation Community Study.)

Table S5 – Quality Metrics to be further developed

	Quality metrics with a description of their selection process (Table S4)	Quality metrics used to measure clinical care (Table 2)	Quality metrics with associations with patient or graft survival (Table 3)	Number of unique publications reporting the quality metric (Figure 1)
Unplanned return to the operating room	**X**	**X**	**X**	**n= 7**
Patient survival¥	**X**	**X**	**N/A**	**n=20**
Efficient evaluation and listing process* ¥	**X**	**X**		**n=5**
Patient satisfaction	**X**	**X**	**X**	**n= 5**
Perioperatory/In hospital mortality	**X**		**X**	**n= 4**
EHR		**X**	**X**	**n=26**
Graft survival ¥		**X**	**N/A**	**n=16**
LOS		**X**	**X**	**n=9**

We examined the metrics listed in Tables 2, 3, and 4, as well as Figure 1, we selected the metrics that were not organ specific and were potentially modifiable. Metrics appearing in three or more of the Tables/Figures are reported in this table.
*Efficient patient evaluation and timely listing of patients
¥ Metrics not currently listed on the National Quality Forum's website for other medical conditions.

Figure S2

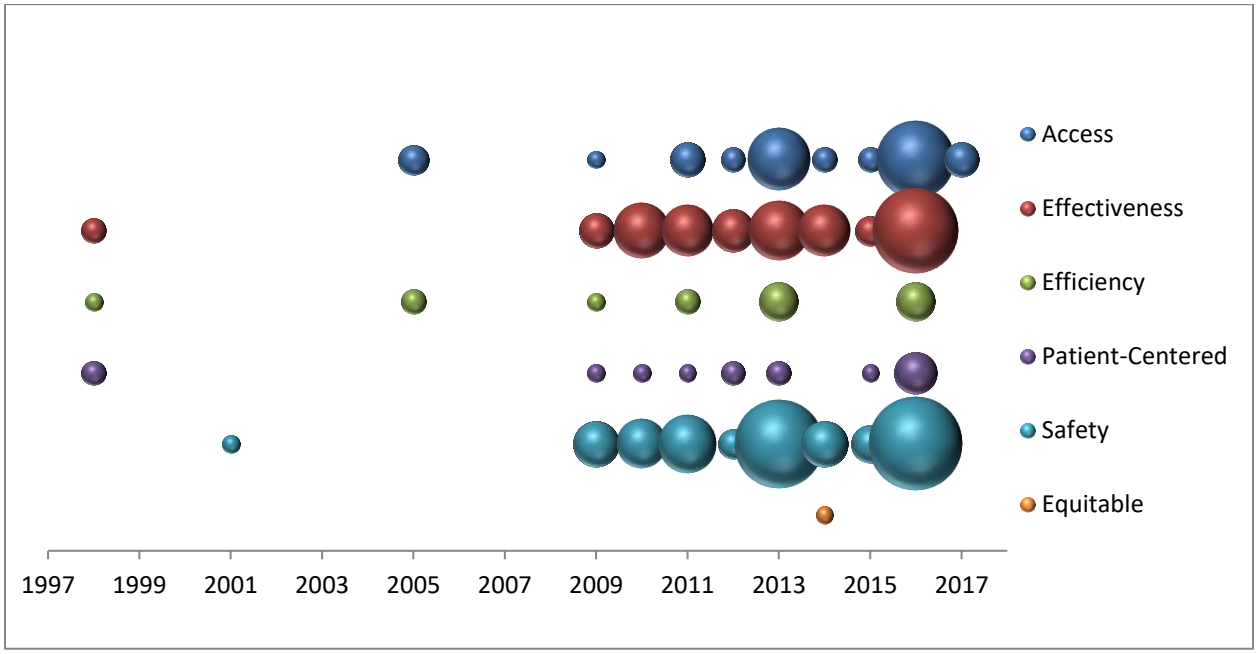
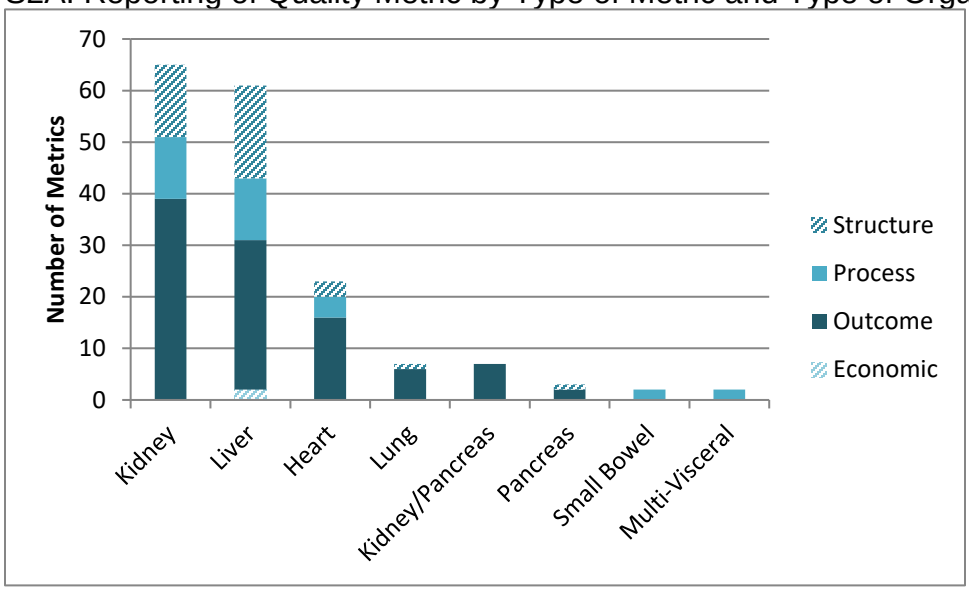


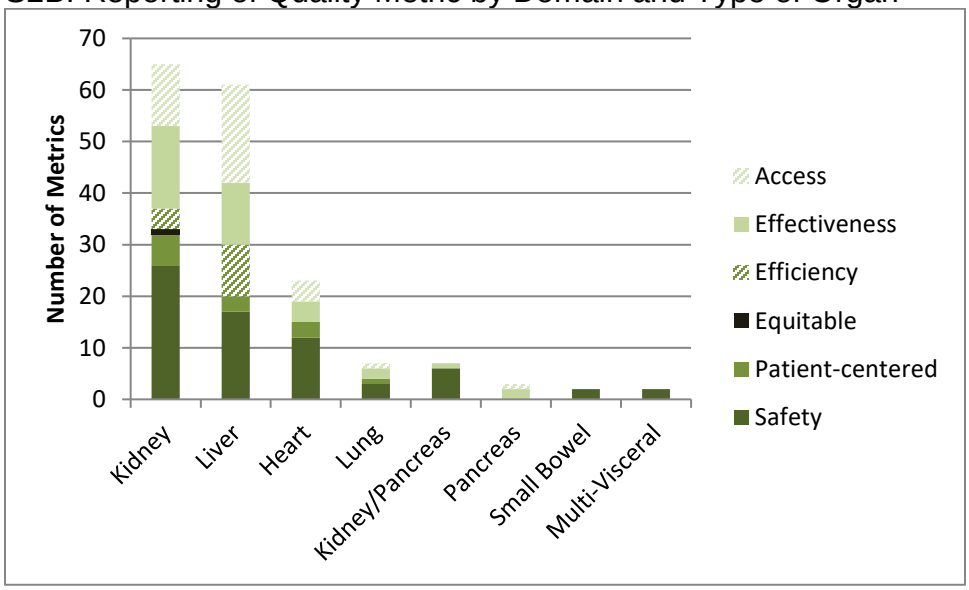
Figure S2. Bubble chart demonstrating the use of the different domains of quality metrics over time. The area of the bubble is proportionate to the number of articles reporting a metric within that domain of quality in that year. If a metric was reported by multiple articles spanning multiple years, then each reference/year was counted as 1 article reporting that domain of quality. If 2 or more articles in 1 year reported a specific metric, then each reference would contribute 1 data point. For example, in-hospital mortality was cited by four articles and was counted as a safety metric in all four years (2011, 2014x2, and 2016).

Figure S3. Quality Metrics by Type of Organ

S2A. Reporting of Quality Metric by Type of Metric and Type of Organ



S2B. Reporting of Quality Metric by Domain and Type of Organ



Multi-visceral = liver/small bowel/pancreas, or liver/small bowel or liver/small bowel/pancreas/kidney

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