APPENDIX A. TABLES

Table 1. Characteristics and Key Findings of Systematic Reviews of Care Transitions, by Patient Population

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Acute MI/ Acute Coronary Syndrome Auer, 2008[34] 1966-2007	16 controlled trials, including 14 RCTs (26 studies total)	Hospitalized for ACS including unstable angina, NSTEMI, STEMI N=2467 from trials, including N=1910 from RCTs	6-12 months: 0.96 (0.79-1.17)	All causes: 0.94 (0.63-1.40) All causes at 1 year: 0.94 (0.63-1.44)	Study quality for RCT assessed using modified Jadad score 3 (lowest ROB category): n=8 2: n=5 1 (highest ROB category): n=3 Before-after designs: n=12 (no formal ROB assessment)
Cancer Smeenk, 1998[54] 1985-1997	5 RCTs (9 studies total)	Cancer N=4249	Range of ratios for readmission (%) in intervention group/control group: 0.62 to 1.12 Combined estimate NR. Timing of readmission assessment NR.	NR	Weighted methodological quality score (0-100 max): 48: n=1 50: n=1 56: n=1 61: n=1 63: n=1 64: n=2 68: n=1 All considered moderate quality
CHF Feltner, 2014[19] 1990-2013	47 RCTs (47 studies total)	Moderate-to-severe HF; mean age of 70 N=8693	Combined RR (95% CI) by intervention type; results from single studies per intervention type not included below: Home-visiting program, 3-6 months: 0.75 (0.66-0.86) Structured telephone support, 3-6 months: 0.92 (0.77-1.10) Telemonitoring, 3-6 months: 1.11 (0.87-1.42) Clinic-based (MDS-HF), 6 months: 0.70 (0.55-0.89)	Combined RR (95% CI) by intervention type; results from single studies per intervention type not included below: Home-visiting program, 3-6 months: 0.77 (0.60-0.996) Structured telephone support, 3.6 months: 0.69 (0.51-0.92) Clinic-based (MDS-HF) 6 months: 0.56 (0.34-0.92)	AHRQ ROB for trials (high, medium, low, unclear) Low ROB: n=6 Medium ROB: n=27 High ROB: n=9 Unclear ROB: n=5

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
COPD Prieto-Centurion, 2014[24] 1966-2013	5 RCTs (5 studies total)	Patients hospitalized for COPD within the previous 12 month. N=1393	2 studies found reduced 12-month readmissions (mean number of hospitalizations per patient, 1.0 vs 1.8;P = 0.01; percent hospitalized, 45 vs 67%;P= 0.028) 3 studies found no significant change in 6 or 12-month readmissions.	4 of 5 studies: no difference 1 study: increased 12-month mortality (17 vs 7%, p=0.003)	EPOC criteria (# domains with low ROB: 1-7 max) 6: n=4 5: n=1
General/ unselected Leppin, 2014[18] 1990-2013	42 RCTs (42 studies total)	N=17273	30 days: 0.82 (0.73-0.91)	NR	EPOC ROB (high, low, unclear) "Most studies were at overall low risk of bias. The most common methodological limitation of these trials was the lack of a reliable method for dealing with missing data." 8/42 studies were rated as low ROB in all categories; all others were rated as high or unclear ROB in one or more categories.
Mental Health Vigod, 2013[55] Database inception through 2012	13 controlled trials, including 8 RCTs (15 studies total)	Admitted to the hospital for mental health inpatient care N=2880 (Controlled trials) N=1007 (RCTs)	Range among studies in % of patients readmitted, intervention group vs control: 3 month: 7-23 vs 13-36 6-24 month: 0-63% vs 4-69%	NR	EPOC criteria (# domains with low ROB: 1-9 max) 8: n=1 7: n=1 6: n=1 5: n=4 4: n=3 3: n=3 Most included studies had small sample sizes, high dropout rates, and/or did not account for baseline differences between groups on key prognostic factors.

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Stroke Prvu-Bettger, 2012[20] 2000-2012	24 RCTs stroke 8 RCTs MI (44 studies total: 27 stroke, 17 MI)	hospitalized for stroke or acute coronary syndromes N=4307 stroke N=1062 MI	Insufficient evidence for most intervention subtypes in both stroke and MI. Moderate strength evidence that hospital-initiated support did not reduce readmissions in stroke patients. Timing of readmission assessment NR.	Low strength evidence in MI patients: reduced 3 month mortality (1 study), reduced 12 month mortality (2 studies)	AHRQ (Good, Fair, Poor Quality) Good: n=10 Fair: n= 42 Poor: n=10 Strength of evidence insufficient for all intervention/population subgroups except as noted.

Abbreviations: ACS = acute coronary syndrome; AHRQ = Agency for Healthcare Research & Quality; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; EPOC = Cochrane Effective Practice and Organisation of Care Group; HF = heart failure; MDS-HF = multidisciplinary heart failure; MI = myocardial infarction; N = population/study sample size; NR = not reported; NSTEMI = non-ST-segment elevation myocardial infarction; RCTs = randomized controlled trials; ROB = risk of bias; STEMI = ST-segment elevation myocardial infarction; Tx = treatment; vs = versus

Table 2. Characteristics and Key Findings of Systematic Reviews of Care Transitions, by Intervention Type

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Geriatric Case Management Huntley, 2013[56] 1950-2010	11 RCTs (11 studies total)	Patients aged 65+ who were discharged from acute care hospitals (ED included) or were community dwelling N=4318	0.71 (0.49-1.03)	Combined estimate NR. Mortality (5 studies) was not significantly different based on case management.	Cochrane ROB "Risk of bias was generally low". Most studies had low or unclear ROB in all categories except one study which had high ROB in 3 categories.
Geriatric Case Assessment Ellis, 2011[35] 1966-2010	22 RCTs (22 studies total)	Adults aged 65 years or older who were admitted to the hospital. N=10,315	No difference between groups, N=3822. OR 1.03 (0.89-1.18)	Death or functional decline, combined outcome: 0.76 (0.64 to 0.90, P=0.001) based on data from 5 RCTs, N= 2622	Cochrane ROB "The studies identified were heterogeneous in quality. All used some method of individual patient randomization, though reporting of key issues such as allocation concealment varied. Outcome assessment was seldom blinded [though] this is less of an issue for hard outcomes such as death or institutionalization". Some trials noted attrition for functional or cognitive outcomes."
Discharge planning Shepperd, 2013[21] 1946-2012	24 RCTs (24 studies total)	Mostly older medical patients, but some trials included a mix of medical and surgical conditions. Psychiatric patients were included as well. N=8,098	Within 3 months of discharge: 0.82 (0.73-0.92) for older patients with a medical condition. No difference was found when mixed medical and surgical populations were included.	At 6-9 months: 0.99 (0.78-1.25)	Cochrane ROB, Low ROB: n=9 Medium ROB: n=9 High ROB: n=5 Unclear ROB: n=1
ERAS/Fast Track Kagedan, 2014[57] 2000-2013	0 trials or RCTs (10 studies total)	After pancreatic surgery N=0 (no RCTs)	Range among studies in % of patients readmitted, ERAS vs UC: (3.5-15) vs (0-25)	Range (% of patients), ERAS vs UC: (0-4) vs (0-3)	GRADE (Low; Moderate; High) "No high-quality studies were identified. Cohort studies comparing multiple groups were labelled as being of moderate quality. Single-group prospective studies were graded as low quality." Moderate quality: n=7 Low quality: n=3

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Hospital at home Caplan, 2012[22] Database inception through 2012	61 RCTs (61 studies total)	N=6992	0.75 (0.59-0.95)	0.81 (0.69-0.95)	EPOC criteria Quality ratings not reported; "Almost all studies were not blinded. However, many studies used blinded initial assessments before randomisation. Some outcome assessment was blinded."
Medication reconciliation Kwan, 2013[23] 1980-2012	5 RCTs (18 studies total)	N=1075	ER visits and hospitalizations within 30 days of discharge in 3 RCTs, HR 0.77 (95% CI, 0.63-0.95)	NR	Cochrane ROB Low ROB: n=5 RCTs
PCMH Jackson, 2013[58] Database inception through June 2012	9 RCTs (19 studies total)	Unselected population N=54465	0.96 (0.84-1.10)	NR	AHRQ (Good, Fair, Poor Quality). All but one study were rated as being good or fair quality.
Telemonitoring and structured telephone support Pandor, 2013[26] 1999-2011	21 RCTs (21 studies total)	Heart failure N=6317	Median HR (credible interval, 2.5%-97.5%) vs UC. All-cause: STS HH: 0.97 (0.70-1.31) TM office hours (transmitted data reviewed by medical staff during office hours): 0.75 (0.49-1.10) HF-related: STS HH: 0.77 (0.62-0.96) TM office hours: 0.95 (0.70-1.34)	Median HR (credible interval, 2.5%-97.5%) vs UC: STS HH vs UC: 0.77 (0.55-1.08) TM office hours vs UC: 0.76 (0.49-1.18)	Study quality not reported individually; "The methodological quality of the 21 included studies varied widely and reporting was generally poor on random sequence generation, allocation concealment, blinding of outcome assessment, definition and confirmation of HF diagnosis, and intention-to-treat analysis."

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Telephone follow-up, primary-care based Crocker 2012[29] 1948-2011	3 RCTs (3 studies total)	Unselected population N=1765	Combined estimate NR. None of the 3 RCTs reported a statistically significant impact of telephone follow-up on readmission or ER visits.	NR	Study quality not reported individually: assessed sequence generation, allocation concealment, blinding, follow-up and intent to treat analysis, and publication bias. Most studies were high or unclear ROB based on poor reporting of sequence generation, allocation concealment; lack of blinding; and lack of information about attrition.
Telephone follow-up, hospital-based Mistiaen, 2006[28] Database inception through July 2003	13 RCTs (33 studies total)	Unselected population with cardiac and surgical subgroup analyses N=5110	Cardiac (3 RCTs, N=616): 0.75 (0.41-1.36) Surgical (4 RCTs, N=460): 0.65 (0.28-1.55)	NR	Cochrane ROB Medium ROB: n=7 High ROB: n=26

Abbreviations: AHRQ = Agency for Healthcare Research & Quality; CI = confidence interval; ED = emergency department; EPOC = Cochrane Effective Practice and Organisation of Care Group; ER = emergency room; ERAS = enhanced recovery after surgery; GRADE = grading of recommendations assessment, development and evaluation; HR = hazard ratio; N = population/study sample size; NR = not reported; OR = odds ratio; RCTs = randomized controlled trials; ROB = risk of bias; STS HH = structured telephone support delivered by human-to-human contact; TM = telemonitoring; Tx = treatment; UC = usual care; vs = versus

Table 3. Clinical Outcomes, Utilization Outcomes, and Implementation Considerations in Systematic Reviews of Care Transitions, by Patient Population

Patient population Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Acute MI/Acute Coronary Syndrome Auer, 2008[34] 1966-2007	Re-infarction rates RR 0.51, 95% CI 0.23 – 1.13 among trials) Smoking cessation RR 1.29 (1.02-1.63, I2 = 66%)	NR	Interventions that included provider- or systems-level components reduced mortality (RR 0.77, 95% CI 0.65-0.92) whereas patient-level interventions did not (RR 0.93, 95% CI 0.63-1.36). However, many of the studies of provider- or systems-level interventions were before-after studies. Interventions targeting an increase in the use of effective medications were associated with mortality benefit (RR 0.80, 95% CI 0.68-0.93) whereas those not targeting medication use were not (RR 0.75, 95% CI 0.39-1.46).	Substantial statistical and clinical heterogeneity among studies. Nearly half the included studies were before-after studies and these accounted for most of the benefit seen [mortality clinical trials only RR was 0.96 (0.64-1.44) vs 0.77 (0.66-0.9) for before-after designs] All studies were published 2005 and earlier; applicability to current practice is uncertain.
Cancer Smeenk, 1998[54] 1985-1997	Quality of life outcomes were positively associated with home care programs in 3 of 7 studies.	NR	Programs that included multidisciplinary team meetings and involvement of team members during patient home visits was associated with favorable outcomes in 3 studies.	Author notes: The methodological quality of the studies was moderate (median score of 62/100). The main shortcomings were in the areas of population homogeneity, study design, comparability of groups, handling of drop outs, and blinding procedures. Furthermore, the findings of failed to show a consistent pattern across studies
CHF Feltner, 2014[19] 1990-2013	NR	NR	The following types of interventions had no effect on mortality: telemonitoring, nurse-led clinics, and primarily educational intervention. (low SOE) Evidence was insufficient for primary care interventions and cognitive training programs.	Minimal 30 day data. UC not well defined and quite variable. Conclusions of this study and the NHS one focusing on TM/STS reach different conclusions with slightly different study inclusion.

Patient population Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
COPD Prieto-Centurion, 2014[24] 1966-2013	NR	NR	Author states: No specific intervention or bundle of interventions could be identified as effective in reducing the rate of rehospitalizations.	Well done systematic review with a focus on readmission. Studies that did not have readmission as the primary outcome were excluded. No studies were found that examined 30-day readmission as a primary outcome, all used either 6 or 12 months. Some studies initiated interventions >28 days after the patient was discharged. Extensive heterogeneity in both the content and context of the intervention.
General/unselected Leppin, 2014[18] 1990-2013	NR	NR	Characteristics of the intervention such as impact on patient workload and the site of delivery had no significant effect.	Adjusted for year of publication
Mental Health Vigod, 2013[55] Database inception through 2012	NR	NR	Study author identified the following as effective components within the context of multicomponent interventions: pre-discharge medication education/reconciliation; post-discharge telephone follow-up, efforts to ensure timely follow-up appointments, home visits and peer support, bridging components of transition manager; and timely communication by in-patient staff with an out-patient care or community service provider during transition.	These results are consistent with the 2 other MH reviews.
Stroke Prvu-Bettger, 2012[20] 2000-2012	No significant differences in ADLs (7 studies using the Barthel index). Insufficient evidence on caregiver outcomes (inconsistent effects on caregiver strain, quality of life in 5 studies measuring caregiver outcomes)	NR	Insufficient evidence of benefit of patient and family educational interventions (5 studies), community based support (10 studies), and chronic disease management (2 studies).	Limitations of the studies include sample size, heterogeneity of outcome measures, lack of definition for the UC group, and fair or poor study quality. Authors cite the need for definitive taxonomy for the components of transitional care services and the evaluation of outcome measures.

Abbreviations: ADLs = activities of daily living; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; MH = mental health; MI = myocardial infarction; NR = not reported; RR = relative risk; SOE = strength of evidence; UC = usual care

Table 4. Clinical Outcomes, Utilization Outcomes, and Implementation Considerations in Systematic Reviews of Care Transitions, by Intervention Type

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Geriatric Case Management Huntley, 2013[56] 1950-2010	NR	ED visits, GP visits, specialist clinic/outpatient visits and length of stay were not improved by case management in all but one study.	Case management initiated in hospital (2 RCTs) was associated with decreased readmissions; 3 out of 4 RCTs showed no difference for case management initiated upon discharge; 5 RCTs on case management initiated in the community showed no significant differences in readmissions.	4 other case management systematic reviews report similar findings: some limited examples of positive results, but overall non-significant effects.[59-62]
Geriatric Case Assessment Ellis, 2011[35] 1966-2010	There was a significant reduction in cognitive function (5 trials, 3317 participants, standardized mean difference 0.08, 0.01 to 0.15, P=0.02) associated with CGA. There were non-significant differences for dependence.	The hospital costs of CGA intervention were mixed – some trials reported decreased cost while others reported increased cost. Few trials accounted for nursing home costs; those that did suggested that CGA might be associated with overall reduced cost.	The positive impact on living at home was seen only in studies of CGA wards and not among studies of mobile CGA consultative teams (interaction $\chi^2 = 9.06$, $p = 0.003$). There is only evidence supporting CGA assessment in setting of geriatric wards, and not for consultative teams. The authors speculate that specialized wards allow nursing and other key personnel to develop skills and expertise and foster multi-disciplinary team-building, while consulting teams might have difficulty in influencing health provider behavior.	Author notes: Trials evaluating direct admission from ED all have admission criteria related to age, whereas trials evaluating post-acute care all have criteria related to needs (with one trial as an exception). Author suggests that the optimal model of comprehensive geriatric assessment for hospitals includes both acute and post-acute models.

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Discharge Planning Shepperd, 2013[21] 1946-2012	CHF patients improved on total CHFQ score in one trial: mean difference 22.1 (20.8), p<0.01; whereas, control patients in a trial of stroke patients had more functional improvement on the Barthel score (2 points change in tx vs 6 points change in controls, p<0.01). QOL outcomes were mixed among studies. No difference between groups in 5 trials that reported functional status, mental well-being, perception of health, self-esteem, and affect.	LOS after medical admission was lower with discharge planning vs UC: mean difference in 10 trials -0.91 days (95%CI -1.55 to -0.27) in 10 trials. LOS after surgery did not differ: mean difference in 2 trials -0.06 days (95%CI -1.23 to 1.11).	The point during admission when discharge planning may have bearing on timely follow-up. Discharge planning was implemented varied across studies: commencing from time admission in 2 trials, 3 days prior to discharge in one study.	Very good review that looked at a wide range of trials including a diverse group of patients. Significant heterogeneity existed between trials with regards to specific interventions. Some interventions were not well described, making comparisons between trials difficult.
ERAS/Fast Track Kagedan, 2014[57] 2000-2013	NR.	Four studies examined costs associated with postoperative care following pancreatic surgery. Two of these studies found a decrease in cost following the implementation of an ERAS protocol and 2 studies found no significant change.	NR	This review focused on pancreatic surgery, and notes that, “Although randomized trials and meta-analyses have consistently reported an advantage to ERAS over conventional care, these studies have been performed predominantly in colorectal surgery patients.”

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Hospital at home Caplan, 2012[22] Database inception through 2012	No meta-analysis was performed for patient or caregiver satisfaction because varied instruments were used, but studies consistently found higher satisfaction in HAH groups (21/22 studies reporting patient satisfaction, 6/8 studies reporting CG satisfaction). No difference in caregiver burden (7 studies, mean difference 0.00, 95% CI -0.19 to 0.19).	Mean cost difference HAH vs UC (11 RCTS): -1567.11 (-2069.53 to -1064.69, p<0.001) Average cost savings 26.5%. 32 of 34 studies reporting any cost data concluded HAH was less expensive.	Mortality, readmission, and cost findings were consistent across all subgroups (type of hospitalization, degree of admission substitutions, average age of patient, and year of publication). Components of HAH programs are not described at all; the only criterion seems to have been home-based care substitution.	Specific components of any of the HAH intervention are not well-described. Periods of observation for mortality and readmissions were not defined and likely varied significantly. "Next best" review has differing conclusions: Cochrane review from 2009 of HAH to facilitate early discharge (as opposed to HAH to replace admission) found no clear difference in mortality in stroke (HR 0.79 [0.32—1.91]) or mixed elderly (HR 10.6 [0.69—1.61]), and they found higher readmissions among the elderly (HR 1.57 [1.10—2.24]). They did find lower rates of residential care and greater satisfaction, with cost data mixed.
Medication Reconciliation Kwan, 2013[23] 1980-2012	Fewer adverse drug events occurred in 2 studies, respectively: Tx vs control: 1% vs 11% (p=0.01) RR 0.72 (95% CI 0.52 to 0.99)	NR	NR	

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
PCMH Jackson, 2013[58] Database inception through June 2012	One observational study reported a higher rate of improved HbA1c and LDL cholesterol in tx patients. Another obs. study found no difference in composite diabetes and CAD outcomes. None of the 3 RCTs found differences in self-reported health status. One observational study found less functional decline with PCMH at 1-year follow-up (31% vs 49% of patients).	Three RCTs reporting ED utilization found no effect: combined RR 0.93 (95% CI 0.72 to 1.20).	NR	The components, models, and operationalization of PCMH varied widely among studies.

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Telemonitoring Pandor, 2013[26] 1999-2011	Quality of life was significantly improved in 3 of 4 studies of STS interventions, and 2 of 4 studies of TM interventions that measured and reported it.	HF-related hospitalizations: STS HM vs UC: 1.02 (0.70-1.49) STS HH vs UC: 0.76 (0.61-0.94) TM office hours vs UC: 0.86 (0.61-1.21). LOS was reported in 6 studies but unaffected in 5 of them (shorter in Tsuyuki et al, 2004).	In the 5 studies that reported it, adherence to RM was good (STS 55-84%, TM 81-98%). Likewise, reported acceptance and/or satisfaction rates were high in 5 of 6 studies. In the sixth, however (Scherr, 2009), 16/66 patients in the intervention group either did not transmit any data or requested early termination. Since RM cannot affect outcomes unless actions are taken based on results of monitoring, any successful intervention also requires patient education/empowerment and advice/timely access to care. Studied interventions were heterogeneous in terms of monitored parameters and HF selection criteria, and results were not reported in such a way as to permit assessment of intervention effect modifiers. Thus, uncertainties remain around best "active ingredients" of RM interventions, suitability of different systems, and determinants of patient responsiveness. Finally, RM is likely to have greater impact in systems where UC is suboptimal and HF readmission rates are high.	This is limited to HF patients and cannot be extrapolated to other patient populations. The authors intended to use meta-regression to explain heterogeneity in effects between studies but could not because of limited data on study-level covariates.
Telephone follow-up, Primary-care based Crocker 2012[29] 1948-2011	NR	In all 3 included studies, primary care contact improved with post-discharge telephone follow-up. 2 studies examining ED visits showed no effect.	NR	Search may have overlooked relevant studies held in other databases.

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Telephone follow-up, Hospital-based Mistiaen, 2006[28] Database inception through July 2003	Anxiety in cardiac surgery patients 1 month post-discharge was not significantly different. Tx vs UC, pooled effect from 3 studies: standardized mean difference -0.47 (95% CI -1.28 to 0.34) Depression was not significantly different between tx and control in 2 studies.	ED visits in surgery patients was not significant. Pooled from 2 studies, tx vs control: RR 1.47 (95% CI 0.85 to 2.53)	NR	Most of the included studies were poor quality (high ROB) and small sample size. The authors cite clinical diversity and statistical heterogeneity among studies as further limitations. They note, however, that patients valued the TFU calls despite no detectable benefits in the measured empirical outcomes.

Abbreviations: CAD = coronary artery disease; CGA = comprehensive geriatric assessment; CHF = congestive heart failure; CHFQ = chronic heart failure questionnaire; CI = confidence interval; ED = emergency department; ERAS = enhanced recovery after surgery; GP = general practice; HAH = hospital at home; HbA1c = glycated hemoglobin A1c; HF = heart failure; HR = hazard ratio; LDL = low density lipoprotein; LOS = length of stay; NR = not reported; PCMH = patient-centered medical home; QOL = quality of life; RCT = randomized controlled trial; RM = remote monitoring; ROB = risk of bias; RR = relative risk; STS = structured telephone support; STS HM = structured telephone support human to machine interface; TFU = telephone follow-up; TM = telemonitoring; Tx = treatment; UC = usual care; vs = versus

Table 5. Studies of Care Transition Interventions Conducted in VA Settings

Study Design and setting (N) Years of observation	Patient population	Intervention	Summary of findings
Ho, 2007[63] Retrospective cohort study using data from all VAMCs (N=4933) 2003-2004	Acute coronary syndromes including acute MI and unstable angina	Inpatient and follow-up cardiology care	Compared with other levels of cardiology care (inpatient only, outpatient only, and neither inpatient nor outpatient), unadjusted all-cause mortality was lower for patients with inpatient and follow-up cardiology care (18.8% vs 22.1%, p = 0.009). In multivariable analysis adjusting for age, race, site, comorbidities, hospital presentation factors (TIMI risk score for STEMI or NSTEMI, left ventricular systolic dysfunction, abnormal serum creatinine level), receipt of PCI and/or CABG surgery, discharge medications, and follow-up visit with a primary care provider within 60 days after discharge, patients with inpatient and follow-up cardiology care remained at lower risk for mortality (HR 0.73, 95% CI 0.62-0.87).
Oddone, 1999[64] Multi-site RCT 9 VAMCs (N=443) Observation period NR	CHF	Enhanced access to primary care	Enhanced access to primary care did not improve quality of life and increased hospital readmissions, with an average of 1.5 ±2.0 readmissions per 6 months of follow-up for patients who had enhanced access compared with 1.1 ±1.8 for those who received UC (*P*= 0.02).
Wakefield, 2008[65] Single site RCT (N=148) 2002-2006	CHF	Home telehealth	Readmission at 12 months comparing telephone and videophone groups combined vs control: 59% vs 41%; unadjusted OR 0.49 (95% CI 0.24-0.98; *p* = 0.04) Risk of all-cause admission was significantly lower in the intervention group, adjusted for age, mean LVEF, NYHA classification, and MLHF instrument proportional hazards model: HR 0.54 (95% CI 0.33-0.90; *p* = 0.02) Mortality did not differ between intervention and control at 3 or 12 months. A Cox proportional hazards model adjusting for age, mean LVEF, NYHA classification, and MLHF found no difference in mortality at 12 months (HR = 1.04; 95% CI: 0.49, 2.24; *p* = 0.91).
Fan, 2012[66] Multisite RCT 20 VA hospital-based outpatient clinics (N=426) 2007-2009	COPD	Comprehensive care management	Trial was stopped early due to excess risk of death in the intervention group (compared with UC; 17 vs 7%, p = 0.003) At that time, the 1-year cumulative incidence of COPD related hospitalization was 27% in the intervention group and 24% in the UC group (HR, 1.13 [95% CI, 0.70 to 1.80]; *P* = 0.62). An extensive evaluation by the study authors failed to identify a reason that mortality was higher in the intervention group.[24]
Fitzgerald, 1994[67] Single-site RCT (N=668) 1988-1990	General medicine/ unselected	Telephone-based follow-up by nurse case managers	No significant differences between intervention and control groups in non-elective readmissions, readmission days, or total readmissions. No significant difference in mortality, Tx vs comparator (%): 10.5 vs 10.4, (p=0.90) Average follow-up, Tx vs comparator (months): 12.14 vs 12.23

Study Design and setting (N) Years of observation	Patient population	Intervention	Summary of findings
Evans, 1993[68] Single-site RCT (N=835) Observation dates NR	High-risk patients (risk-screening index score* >=3)	Discharge planning	Patients receiving early discharge planning were more likely to return home after hospitalization and less likely to be readmitted within 9 months. Tx vs control, % of patients: 30-day readmission: 24 vs 35 (p=0.001) 9-month readmission: 55 vs 61 (p=0.08) Discharged to home: 79 vs 73 Discharged to nursing home: 15 vs 22 (p=0.05 for discharge location) Deceased at discharge: 2 vs 2 (p=NS) Deceased at 9 months: 16 vs 16 (p=NS) At home at 9 months: 62 vs 54 In nursing home at 9 months: 19 vs 26 (p=0.05 for location at 9 months)
Kasprow, 2007[69] Multi-site implementation study with historical controls 8 VAMCs (N=484) 2001-2004	Homeless Veterans hospitalized for mental illness	Critical time intervention community case management with structured needs assessment	Compared with historical controls, the intervention cohort: • Had significantly fewer psychiatric problems at 3-, 6-, and 9-month follow-up (p<.001, p<.001, and p=.005, respectively). • Spent significantly fewer days in institutional settings at the 6-, 9-, and 12-month follow-up intervals (p=.01, p=.001, and p=.001, respectively) compared with historical controls. • Had significantly more days housed at 6-, 9-, and 12-month follow-up (p=.02, p=.001, and p=.001, respectively). • Had significantly lower alcohol use than historical controls at 3-, 6-, and 9 month follow-up (p<.001, p<.001, and p=.001, respectively). • Had significantly lower drug use at 3-, 6-, and 6-month follow-up (p<.001, p<.001, and p=.04, respectively).
Weinberger, 1996[31] Multi-site RCT 9 VAMCs (N=1396) 1992-1994	Inpatients with DM, COPD, or CHF	Discharge planning	In an intensive primary care intervention involving close follow-up by a nurse and PCP from pre-discharge to 6 months post-discharge, the proportion of patients readmitted within 6 months did not significantly differ between intervention and control patients: 49% vs 44% (p=0.06)

Study Design and setting (N) Years of observation	Patient population	Intervention	Summary of findings
Cummings, 1990[70] Single-site RCT (N=419) 1984-1987	Severely disabled or terminally ill patients	HBHC	Total VA hospital days did not significantly differ between HBHC and control groups. HBHC patients spent a greater proportion of their hospital stay on the intermediate care ward (3.0 days vs 1.5 days) p<.03) and less time on general care wards (8.5 days vs 12.2 days, p<.04) than control group patients. Total per-patient hospital costs were lower in the HBHC group vs controls ($3000.24 vs $4245.84, p=0.03). HBHC patients had greater satisfaction with care (0.1 on a 3-point scale, p<.001) than controls, at 1 month. No significant group differences in satisfaction at 6 months. No significant differences in patient morale at either 1 or 6 months.

* Evans RL, Hendricks RD, Lawrence KV, Bishop DS. Factors influencing use of health care resources: A hospital-based risk screening index. *Soc Sci Med* 1988; 27(9):947.

Abbreviations: CABG = coronary artery bypass graft; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; HR = hazard ratio; HBHC = hospital-based home care; LVEF = left ventricular ejection fraction; MI = myocardial infarction; MLHF = Minnesota Living with Heart Failure; N = population/sample size; NR = not reported; NSTEMI = non-ST-segment elevation myocardial infarction; NYHA = New York Heart Association; OR = odds ratio; PCI = percutaneous coronary intervention; PCP = primary care provider; RCT = randomized controlled trial; STEMI = ST-segment elevation myocardial infarction; TIMI = Thrombolysis in Myocardial Infarction; UC = usual care; VA = Veterans Affairs; VAMCs = Veterans Affairs Medical Centers

APPENDIX B. SEARCH STRATEGY

Concept	Search string
recurrence	"recurrence"[MeSH Terms] OR "recurrence"[All Fields]
recurrences	"recurrence"[MeSH Terms] OR "recurrence"[All Fields] OR "recurrences"[All Fields]
hospital-based home care	"home care services, hospital-based"[MeSH Terms] OR ("home"[All Fields] AND "care"[All Fields] AND "services"[All Fields] AND "hospital-based"[All Fields]) OR "hospital-based home care services"[All Fields] OR ("hospital"[All Fields] AND "based"[All Fields] AND "home"[All Fields] AND "cares"[All Fields])
eHealth	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "ehealth"[All Fields]
telehealth	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "telehealth"[All Fields]
telemedicine	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields]
continuity	"Continuity"[Journal] OR "continuity"[All Fields]
referral	"referral and consultation"[MeSH Terms] OR ("referral"[All Fields] AND "consultation"[All Fields]) OR "referral and consultation"[All Fields] OR "referral"[All Fields]
discharge	"patient discharge"[MeSH Terms] OR ("patient"[All Fields] AND "discharge"[All Fields]) OR "patient discharge"[All Fields] OR "discharge"[All Fields]
sub-acute care	"subacute care"[MeSH Terms] OR ("subacute"[All Fields] AND "care"[All Fields]) OR "subacute care"[All Fields] OR ("sub"[All Fields] AND "acute"[All Fields] AND "care"[All Fields]) OR "sub acute care"[All Fields]
subacute care	"subacute care"[MeSH Terms] OR ("subacute"[All Fields] AND "care"[All Fields]) OR "subacute care"[All Fields]
cochrane database syst rev[ta]	"Cochrane Database Syst Rev"[Journal]
acp journal club[ta]	"ACP J Club"[Journal]
health technol assess[ta]	"Health Technol Assess"[Journal]
evid rep technol assess summ[ta]	"Evid Rep Technol Assess (Summ)"[Journal]
evidence-based medicine[mh]	"evidence-based medicine"[MeSH Terms]
behavior and behavior mechanisms[mh]	"behavior and behavior mechanisms"[MeSH Terms]
therapeutics[mh]	"therapeutics"[MeSH Terms]
risk[mh]	"risk"[MeSH Terms]
death	"death"[MeSH Terms] OR "death"[All Fields]
treatment outcome[mh]	"treatment outcome"[MeSH Terms]
Humans[Mesh]	"humans"[MeSH Terms]
adult[MeSH]	"adult"[MeSH Terms]

Database: PubMed
Date of search: 5/02/2014

Filters activated: Humans, English, Adult: 19+ years
User query: (((((((("Recurrence"[Mesh]) OR "Patient Readmission"[Mesh])) OR ((((readmission) OR readmissions) OR recurrence) OR recurrences))) AND ((((((((((((((((((((((((((((((("exercise therapy") OR "physical therapies") OR "physical therapy") OR "non-professional home care") OR "nonprofessional home care") OR "home nursing") OR "hospital-based home cares") OR "hospital-based home care") OR "hospital home care services") OR "hospital based home cares") OR "mobile health") OR eHealth) OR telehealth) OR telemedicine) OR "clinical pathways") OR "clinical pathway") OR "clinical paths") OR "clinical path") OR "critical paths") OR "critical path") OR "critical pathway") OR "critical pathways") OR continuity) OR referral) OR discharge) OR sub-acute care) OR subacute care) OR posthospital*) OR post-hospital*) OR postacute care) OR post-acute care) OR coordinate) OR coordination) OR post-discharge) OR postdischarge) OR transition*)) OR ((((((((((("Case Management"[Mesh]) OR "Rehabilitation"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Discharge"[Mesh]) OR "Patient Transfer"[Mesh]) OR "Telemedicine"[Mesh]) OR "Critical Pathways"[Mesh]) OR "Home Care Services, Hospital-Based"[Mesh]) OR "Home Nursing"[Mesh]) OR "Physical Therapy Modalities"[Mesh]) OR "Exercise Therapy"[Mesh])))))) AND (((systematic review[ti] OR meta-analysis[pt] OR meta-analysis[ti] OR systematic literature review[ti] OR (systematic review[tiab] AND review[pt]) OR consensus development conference[pt] OR practice guideline[pt] OR cochrane database syst rev[ta] OR acp journal club[ta] OR health technol assess[ta] OR evid rep technol assess summ[ta] OR drug class reviews[ti]) OR (clinical guideline[tw] AND management[tw]) OR ((evidence based[ti] OR evidence-based medicine[mh] OR best practice*[ti] OR evidence synthesis[tiab]) AND (review[pt] OR diseases category[mh] OR behavior and behavior mechanisms[mh] OR therapeutics[mh] OR evaluation studies[pt] OR validation studies[pt] OR guideline[pt] OR pmcbook)) OR ((systematic[tw] OR systematically[tw] OR critical[tiab] OR (study selection[tw]) OR (predetermined[tw] OR inclusion[tw] AND criteri*[tw]) OR exclusion criteri*[tw] OR main outcome measures[tw] OR standard of care[tw] OR standards of care[tw]) AND (survey[tiab] OR surveys[tiab] OR overview*[tw] OR review[tiab] OR reviews[tiab] OR search*[tw] OR handsearch[tw] OR analysis[ti] OR critique[tiab] OR appraisal[tw] OR (reduction[tw] AND (risk[mh] OR risk[tw]) AND (death OR recurrence))) AND (literature[tiab] OR articles[tiab] OR publications[tiab] OR publication[tiab] OR bibliography[tiab] OR bibliographies[tiab] OR published[tiab] OR unpublished[tw] OR citation[tw] OR citations[tw] OR database[tiab] OR internet[tiab] OR textbooks[tiab] OR references[tw] OR scales[tw] OR papers[tw] OR datasets[tw] OR trials[tiab] OR meta-analy*[tw] OR (clinical[tiab] AND studies[tiab]) OR treatment outcome[mh] OR treatment outcome[tw] OR pmcbook)) NOT (letter[pt] OR newspaper article[pt] OR comment[pt]))) AND (Humans[Mesh] AND English[lang] AND adult[MeSH])

ADDITIONAL SEARCH FOR PATIENT CENTERED MEDICAL HOME

Database: PubMed
Date of search: 8/27/2014

User query: ((((medical home[Title]) OR medical homes[Title]) OR pcmh[Title])) AND "Patient-Centered Care"[MeSH] AND (systematic[sb])

APPENDIX C. FIGURES

FIGURE 1. LITERATURE FLOW DIAGRAM

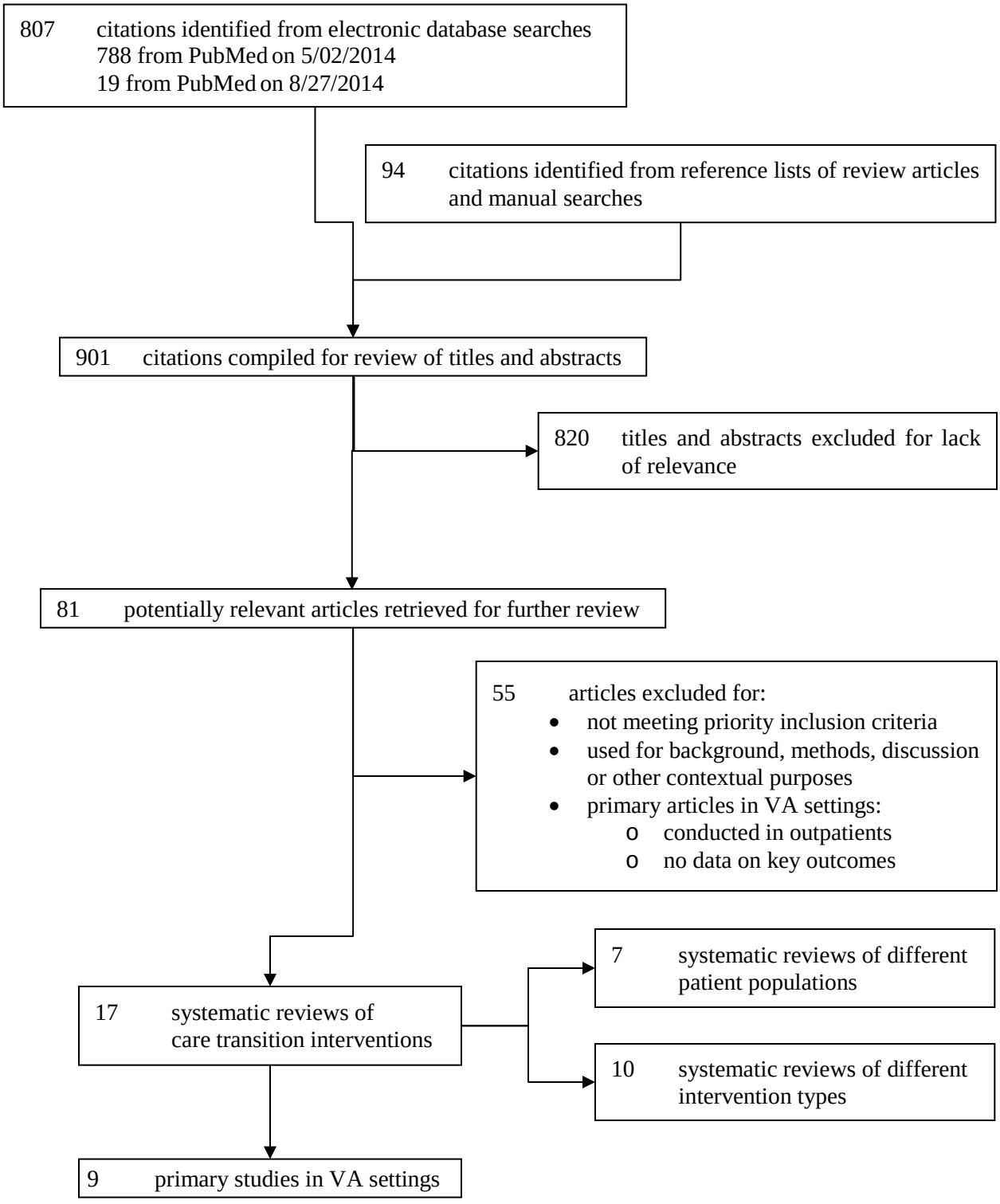

FIGURE 2. TRANSITIONAL CARE MAP

<table>
<tr><td>Setting</td><td></td><td colspan="3"></td><td></td><td></td></tr>
<tr><td rowspan="5">Core Processes</td><td>Advanced care planning</td><td colspan="3">Anticipatory discharge planning and care coordination
- Post-DC services (ie, DME, SNF, home health, transportation) arranged
- Patient has a clear point of contact across settings
Readmission risk assessment</td><td>Reassessment of signs/ symptoms
- Follow up call
- Home Visit for high risk patients
Ongoing telephone follow-up (eg, structured telephone support) for select patients</td><td>Timely ambulatory follow up</td></tr>
<tr><td>Proactive communication
- PACT team alerted on admission
- Means of communication between primary care team and hospital team</td><td colspan="2">Continued communication with hospital and ambulatory providers at key junctures (ie, end of life decisions, opioid pain management, other key medical decisions)</td><td>DC summary completed and transmitted
Patient-level transition record (PHR, AVS)</td><td></td><td>Outstanding test follow through</td></tr>
<tr><td></td><td>Psychosocial Needs assessment</td><td colspan="3">Patient/ Caregiver engagement and education with focus on:
- Self-management including red flags/ warning signs
- Medication changes
- Follow up</td></tr>
<tr><td></td><td>Admission med rec</td><td colspan="2"></td><td>DC med rec</td><td></td><td>PCP med list updated</td></tr>
<tr><td></td><td colspan="6">Patient/ caregivers</td></tr>
<tr><td rowspan="5">Key team members</td><td>PCP</td><td colspan="3">Hospital MD</td><td></td><td>PCP</td></tr>
<tr><td></td><td colspan="6"></td></tr>
<tr><td></td><td colspan="3">Hospital RNs, social workers, PT/OT, inpatient pharmacists</td><td>home health, PT/OT</td><td>Outpatient pharmacists</td></tr>
<tr><td></td><td colspan="4"></td><td></td><td>Ambulatory RNs</td></tr>
<tr><td></td><td colspan="6">Transitions coaches, peers</td></tr>
</table>

Figure 2. This transitional care map can guide transitional care improvements, and represents the core components of an ideal transition. We suggest that many of these elements be incorporated into best practice for all care transitions. For example, practices of proactive communication, anticipatory discharge planning, patient/ caregiver communication, and timely completion of a discharge summary ought to be standard work for all patients and in any system. However, other elements, such as use of a formal readmission risk tool, detailed pharmacist-guided medication reconciliation, or reassessment of signs and symptoms after discharge via a home visit may be more important in some settings and populations. The arrows at the points of transition indicate that, in some cases, the primary care team may be able to "reach-in" to the hospital as a means of care coordination. **Advanced care planning** around goals of care at the end of life can be an important part of transitional care from primary care to the hospital, and in particular among patients with terminal illness or geriatric patients, can be initiated in the primary care setting and help guide inpatient care decisions, or potentially avoid unwanted admission altogether. Similarly, if a change in functional status is anticipated after a planned hospitalization – for example, after planned hip replacement – decisions around choice of skilled nursing facilities and other post-discharge needs might be best coordinated prior to hospitalization.

Proactive Communication in which the hospital team alerts primary care that a patient is hospitalized, and in which, key history from the primary care setting is communicated forward to the hospital team. A well-integrated and complete medical record may be sufficient in most circumstances. However, where systems are less integrated or where more complex medical or social factors are at play, a warm handoff from primary care to hospital providers can be beneficial.

Anticipatory discharge planning is a key element of all hospital-to-home transitions. We suggest that all team members – including physicians, inpatient nurses, social workers, physical and occupational therapists, as well as family and caregivers – are supported to anticipate and prepare for post-discharge needs such as durable medical equipment, home health, and transportation. Multidisciplinary meetings conducted during inpatient rounds may be an efficient way to accomplish much of this discussion.

Readmission risk assessment for the purposes of identifying patients for transitional care interventions can be performed at admission, discharge, or even in the post-discharge period depending on the nature of the intervention. For example, some interventions incorporate length of stay as a variable, and thus would be performed on discharge and are best used to guide post-discharge interventions. Other interventions are intended to begin during hospitalization, and thus are best performed early on hospitalization. See Policy Implications section for more discussion of risk assessment.

Psychosocial needs assessment should assess factors such as access to outpatient care, ability to afford needed medications, health literacy and numeracy, housing, transportation, and social/caregiver support. These factors inform a more accurate understanding of a patient's ability to self-manage care after hospitalization, whether caregivers should be involved in self-management education, and should guide decisions around role for home health or skilled nursing placement, complexity of medication regimens, and any additional transitional care needs that patient's might need to be successful after hospitalization.

Communication with hospital and ambulatory providers during hospitalization may be important at key junctures, for example, around end of life decision-making or around prescribing opioids in high-risk situations, where the success of the plan hinges on the patient's outpatient providers and care environment.

Patient/ Caregiver engagement and education should occur throughout hospitalization and utilize teach-back to assess patient understanding. Education can be tailored to focus on transitional care pillars which include: patient understanding of self-management including red flags and warning signs that should prompt further medical attention, medication changes, and a clear follow-up plan. These activities are an opportunity to improve patients' self-efficacy and confidence in self-management, as well as empowering them to serve as their own advocates while transitioning across care settings.

DC summaries should be completed within a reasonable time frame of discharge (some suggest within 24 hours of discharge), should be complete, and transmitted effectively to appropriate outpatient providers. Some key elements of discharge summaries include hospital course and discharge diagnoses, an accurate medication list with rationale for new or discontinued medications, results of key procedures, pending studies and any suggested next steps in evaluation, follow up appointments, discharge location (*ie*, home, name of SNF), suggested next steps in evaluation, and a physical examination that includes cognitive and functional status.

Patient-level transition record might vary depending on the system and patient. All patients should receive basic written instructions that include an accurate medication list and clear instructions to stop or start any medications and self-care instructions that avoid overly complex language. Some patients may benefit from additional written materials such as a pictorial medication calendar or a more detailed personal health record. For some high-risk populations (*eg*, CHF patients), there may be some utility in creating (or vetting existing) educational tools/instructions, many elements of which may be applicable to most patients, and which can have sections that are individually adaptable as well.

Medication reconciliation, while not supported by literature to reduce readmission rates, is an expected part of any hospital admission and discharge. Depending on patient risks and medication complexity and existing resources this may best be performed by a pharmacist versus an inpatient provider.

Reassessment of signs and symptoms: optimal approaches to reassessing signs and symptoms after discharge may depend on system and patient characteristics. For example, there is some evidence that a home visit after discharge can improve care and reduce readmissions among high-risk patients, however it is neither feasible nor cost effective for all patients to receive a home visit after discharge. Similarly, systems best consider who performs a phone call after hospitalization (perhaps primary care teams, to assure a close connection back to primary care, or perhaps the health plan to assure that all medications and equipment have been supplied, and to expedite approval and scheduling of any needed appointments).

Ambulatory follow up: the optimal timing for post-discharge follow-up is unclear and likely differs based on patient need and medical acuity.

Outstanding test follow through: errors due to lack of follow through on tests (lab, imaging, pathology) pending at the time of discharge are common. It is important that there is a shared understanding of accountability for test follow-through among outpatient and inpatient care teams, and a seamless process for communicating outstanding tests and responsibility for follow through across care settings.

APPENDIX D. INCLUSION/EXCLUSION CRITERIA

Key Questions	**KQ1. What are the overlapping elements identified in existing systematic reviews that promote successful hospital-to-home transitions?** We propose a review of systematic reviews to identify the common themes that have emerged from reviews that have focused on specific patient populations (*eg*, MI, pneumonia, COPD, and CHF). We will then identify randomized controlled trials that include diverse patient populations and test the effects of transitional care interventions on readmission rates (KQ2).	**KQ2. How do intervention, population, and health care setting characteristics modify the effectiveness of transitional care interventions in lowering readmissions and/or reducing mortality?** a. What are the key intervention subcomponents that are common to successful interventions? b. How do implementation characteristics such as the facilitator, intensity, and method of contact modify intervention effects? c. Are there different characteristics of successful interventions in integrated and non-integrated health systems? d. How do the characteristics of successful interventions vary among different patient populations?
Population	Include: Adults discharged from the hospital - any disease specific medical population (cardiovascular, respiratory illness, *etc*), or general medical population - any surgical population (inclusion in KQ2 contingent on yield) Exclude: pediatric; O/B	
Intervention	We will define interventions as those that include "a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or different levels of care" (Coleman 2004) and/or help prepare patients/caregivers to self-manage their care after discharge from a hospital. Interventions can take place before or after discharge, or include components that span settings (aka bridging interventions). Key processes of interventions may include patient education, motivational interviewing, medication reconciliation, risk-based dosing, monitoring/remote data collection, personal health record, single point of contact, outpatient/provider follow-up, advanced care planning, and care coordination. Characteristics of the intervention, such as facilitator, recipient, intensity (frequency and duration), method of contact, and other aspects, may vary, and will be abstracted and analyzed as covariates.	
Comparator	Usual care, or other included intervention (*ie*, head-to-head trial)	
Outcomes of interest	Primary outcomes of interest: readmission rate, mortality Secondary outcomes: • Quality of life • Functional status • ER utilization • Long-term care placement	Readmission rate Mortality
Timing	Any timeframe	
Included study designs	Systematic reviews, meta-analyses, meta-regression studies	Controlled clinical trials
Excluded study designs	Observational studies, case series, case reports	

<table>
<tr>
<td>Setting</td>
<td>

Any setting within US; integrated and non-integrated
We will include studies in other countries that have health systems, or parts of their health system, that resemble the VA

There are essentially three schemes for universal health care:

The UK National Health Service Model is publically financed through taxation and is characterized by state ownership of most hospitals and clinics. Many physicians are employed by the state.
The Bismarck Model uses highly regulated non-profit health insurance funds that are financed through joint employer/employee contributions. Most hospitals are privately owned and most physicians are privately employed.
The National Health Insurance Model is a hybrid of the first two. A publically financed, governmentally run single payer purchases care from private providers.

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>UK NHS Model</td><td>UK, Spain, Italy, Norway, Finland, Sweden,</td><td>Hong Kong, New Zealand,</td></tr>
<tr><td>Bismarck Model</td><td>Germany, France, Belgium, the Netherlands, Switzerland</td><td>Japan</td></tr>
<tr><td>National Health Insurance Model</td><td>Canada</td><td>Taiwan, South Korea, Australia</td></tr>
</table>

Discharged from hospital to home
Discharged from hospital to skilled nursing facilities

Exclude: studies of patients transitioning from outpatient setting or from skilled care facility
</td>
</tr>
</table>

APPENDIX E. REVIEWER COMMENTS AND RESPONSES

PR #	Comment	Response
Are the objectives, scope, and methods for this review clearly described?		
1-8	All reviewers entered "Yes"	Noted.
Is there any indication of bias in our synthesis of the evidence?		
1-8	All reviewers entered "No"	Noted.
Are there any published or unpublished studies that we may have overlooked?		
1-3 5-7	No	Noted.
4	Yes - I have heard that a study was published on the IPEC Readmissions tool, and so it seems odd its not even mentioned in your compilation of studies.	Thank you for the suggestion. The IPEC tool would not be eligible for our review because it does not meet inclusion criteria for intervention type.
8	Yes - CMAJ 2004;170(3):345-9 Adverse events among medical patients after discharge from hospital NTOCC September 2008 Update, Transitions of Care Measures, Paper by the NTOCC Measures Work Group, 2008	Thank you for the suggestion. We examined the suggested study and determined that it does not meet inclusion criteria for intervention type.
Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.		
1	Congratulations to the authors on a very ambitious undertaking. This is an impressive review of the literature, and a respectable attempt at deriving standardized, quantifiable and generalizable knowledge around best practices in transitional care improvement.	Noted, thank you.
1	I agree with the author's conclusions, and believe it is supported by the reviewed material and the tables. However the clarity and potential impact of this paper is reduced by a lack of definitions or consistency for many of the terms used throughout, such as 'intervention,' intervention component,' intervention characteristic,' 'elements,' and 'population.' I suspect that elements, components and characteristics often mean the same thing, and/or characteristics include all of the above, but there are examples where the authors seem to indicate that these terms mean something more specific, but then seem to not use them consistently for those specific meanings. 'Characteristics' is carefully defined as facilitator, recipient, intensity, etc in the inclusion/exclusion criteria, but there are instances in the paper that seem to imply that 'characteristics' is used more generally as a way of describing variation in interventions, patients and setting generally. The title to Table 2 is one example. There were many instances where I was unsure whether or not the term 'intervention' meant 'intervention components,' also called 'key processes' in the tables, or was referring to a named	We agree that the terminology used is inconsistent and confusing. We have added definitions of intervention type, patient population, and intervention characteristics to the first paragraph of the Methods section. We have revised the rest of the report to be more consistent in the use of these terms.

PR #	Comment	Response
	evidence-based intervention model, which is usually comprised of many components. 'Specific populations' sometimes seemed to mean clinical condition, sometimes demographic features, sometimes treatment setting and sometimes risk status. If all of those ways of slicing populations are what is meant by 'specific' it would be helpful for the authors to have said this plainly somewhere early in the paper. This is in my view exactly what much of the research in transitional care suffers from, and which is holding us back from comparative effectiveness studies, and is in fact mentioned many times in this paper, and that is a standard taxonomy. Table 2 categorizes interventions by main activities, but some are multi-component categories (eg Hospital at Home) and some are single components (f/u phone calls). This led me to be confused for the rest of the paper about what is meant by 'intervention type.' p 13 lns 43-45 Again interventions that are single component and some that are multi-component p 13 lns 22-25 Intervention types here is equated with processes of care, but again includes interventions that are single component or single processes, and interventions that are complex multi-component, leaving confusion about what you mean by 'intervention' and 'intervention type.' pp 13 - 15 This examines several individual components, but includes components likely included in other 'intervention types.' It is hard to draw conclusions from this. Although the authors do explain this, and note the difficulty deriving conclusions because of it, it leaves the reader not knowing what the authors in this paper consider to be an 'intervention.' p 18 first paragraph - what do the authors mean at this point by 'intervention type'? Single conponent vs multi-component? The presence of the specific components showing promising results?	
1	It would help me follow this complex paper better if the introduction included a description of the usual transitional care given in the VA, and how it is evolving - ie new activities that have been introduced for the purposes of improving care transitions and/or reducing readmissions; and the methods section began with an overview of the taxonomy problem (which is included in the results section, and is well done) with a summary of how the authors intend to define their own taxonomy for the rest of this paper. It would help ground the reader in the elements/components/characteristics that are the highest priority to examine closely, and the yardstick by which the paper intends to examine them.	We have added some VA specific information to the background, and added some definitions to the first paragraph of the methods section.

PR #	Comment	Response
1	METHODS - The introduction describes the method for establishing patient populations and intervention categories and references Tables 1 and 2. Table 1 makes it clear that population categories are clinical; if this is what is meant by 'population' throughout the rest of the paper, it would be helpful to just state that - that populations refer to patients grouped according to condition. p 17 ln 17 This refers to 'specific populations' and seems to mean clinical condition only.	We agree – we have revised accordingly.
1	P 11 - I found this discussion of taxonomies very helpful, and would have found it more helpful if it had been introduced in the Methods section with a definition of terms for this paper.	Agree – included the taxonomy in first paragraph of methods.
1	P 12 line 41 - needs closing parens	Done
1	P 13 ln 24 'several show promise' needs refs	Added
1	p 18 ln 29 Does 'specific intervention' here mean components or larger multi-component models?	Revised to refer to intervention types
1	p 18 lns25-26 'Variation of population' seems awkward. Maybe 'Variations in' or 'Variability of'?	Corrected
1	P 19 - might consider adding to this list 'Development of a standard taxonomy is desparately needed'!	Done
1	P20 ln 30 I am assuming that the research team developed the map as a result of this review? Would be good to state that plainly. Is this based on the review alone or the combination of the review and the experience within the VA? I like the map - could be a great way to categorize components in the future.	We were more explicit in describing this as part of the review. We left in the description of specific elements used to develop the map.
1	p 21 ln 24-25 'Transitional care nurse' refers to a named comprehensive intervention model. It would be more accurate to describe this as 'a nurse dedicated to key activities to support better transitional care.'	We edited the "care transitions and PACT" section on page 18 (where the term is first used). We used the suggested wording after referencing the Care Transitions Intervention and we applied quotations to the term.
1	p 25 ln 8 I am not familiar with "CBOC"	Clarified
1	p 26 ln 41 'post discharge calls have become a major vehicle for transitional care aty the VA' - it seems that this should have been introduced earlier, as one of the stated goals of this review is to determine what the VA should invest in for transitional care improvement. See my earlier comments.	As above, we added more VA-specific detail to the background including mention of current use of these calls.
1	p 27 ln 45+ There are many current initiatives doing exactly this. It might be more accurate to say 'adapt the continuous quality imrpvement methods used by other initiatives for the VA setting and population.'	Thank you for the suggestion – we have revised accordingly
1	p15 ln13 'older Cochrane review' - it would be helpful to put in the year this was published	Done

PR #	Comment	Response
	because the divide in effectiveness at 2002 has already been referenced.	
1	p16 ln 28 In this section 'population' is defined a number of ways other than clinical condition - demographic factors, risk status	See comments above – we clarified that population could refer to clinical condition or demographic characteristics in Methods section
1	Future research - Might add the need to better understand the changes in usual care before and after 2002 to help interpret effectiveness studies in the future.	Agree, added.
1	Conclusions - I think the lack of a common taxonomy cannot be overstated, as it is on this that comparisons could be made and therefore comparative effectiveness studies be performed.	We added this to the conclusion
1	Table 1 - The authors are clear that they did not set a timeline for readmissions as an inclusion criteria, but it would be helpful to include a column or otherwise note what the time to readmissions was for each set of reviews if possible.	We added timing information where available.
1	Table 2 - Would help scan this table to put in bold those processes with statistically significant results.	Agree; done.
1	Figure 2. Transitional care map - Consider adding 'activation' to "Patient/Caregiver education" as it is much discussed in the transitional care literature.	Added this to the description of this item, and added the term "engagement"
3	General comments: This is a challenging literature base to synthesize; the authors appear to have captured recent systematic reviews focused on transitional care. I marked "no: for studies that were overlooked. However, I suggest that the authors make sure they are citing the most recent Cochrane review on structured telephone support/ telemonitoring interventions: Reference # 24 ("older Cochrane review" cited on page 15, line 15. I believe this was updated by the Cochrane collaboration (in 2008): http://www.thecochranelibrary.com/userfiles/ccoch/file/Telemedicine/CD007228.pdf	The study at the suggested link (Inglis 2010) was not included because it looks broadly at CHF populations, not recently discharged patients.
3	In the background section of the main report (and ES) I could not get a sense of the scope of the readmission problem as it relates to the VA. For example, are overall readmission rates similar to rates in Medicare populations? And do the same conditions (HF, acute MI, etc...) account for similar % of total readmissions?	See earlier comment – we added VA specific readmissions information to the background section.
3	Throughout the report, there is inconsistent use of abbreviations (particularly for CHF); for example page 14 (line 520 "congestive heart failure" is spelled out int the first sentence but no in the second. I noted a few of these cases below, but suggest word searching or having the editor check the final copy. Page 3, line 58: Consider abbreviating congestive heart failure here or adding acronym if it has not been called out previously. "CHF" is used on page 4, line 55. line 21: CHF could be used instead of spelling this out.	Done
3	Specific comments: Preface (ii): Person listed as the PI on page i (Devan Kansagara) does not	Noted and corrected, thanks

PR #	Comment	Response
	appear to be listed as an author in the "recommended citation" on page ii. I am not sure if this is an oversight?	
3	Executive Summary: page 1, first paragraph: -In line 11, I recommend that "admissions" be changed to readmission or readmission rates.	Done
3	-The first sentence of the executive summary is not clear and maybe a little redundant. I'm not sure we can say that there has been an "exponential" increase in the implementation of transitional care programs- certainly hospitals are increasingly focused on reducing readmission rates and improving care transitions. One suggestion: "Health care systems are increasingly focused on efforts to reduce hospital readmissions; a wide variety of evidence exists on interventions to reduce readmissions, and national and local quality improvement efforts focused on transitional care have also been developed."	This was referring to a citation showing the breadth and rapidity of program interest over a brief period of time. Nevertheless, we have reworded and appreciate the suggested language.
3	page 2, line 14: Sentence starting with "Policy implications...." would be helpful to briefly note the variety of clinical and research experience.	The clinical and research experience of the investigators is detailed in the corresponding section of the main report – we left the details out of the executive summary in an effort to keep it relatively brief.
3	page 3, line 40: PCMH had no effect on admissions or should this be readmissions?	Changed to readmissions
3	page 5, line 20: Consider using readmissions (instead of rehospitalizations) for consistency.	Changed
3	Background: page 8, line line 25-26. Are there other financial penalties besides CMS's HRRP? If not, I would specifically list this program and maybe what patient populations are covered (...unless this is not relevant to the VA).	This is less relevant to VA, but we did edit this section to note several CMS initiatives.
3	page 8, line 32-33. See comment from ES. I'm not sure that we know enough about implementation efforts around transitional care components/programs in order to justify using "exponential." It seems there is more of a concern about low rates of implementation, or implementation of some components (but not others) of the multicomponent interventions that are supported by the evidence.	As noted above, we changed the language accordingly.
3	page 10, line 38. I suggest adding the specific populations (X on HF, X on acute MI...etc).	We only selected one review for each patient population or intervention type category.
3	page 12, line 43. Parentheses is missing here. I think the sentence "They found interventions "which" should be changed to "with"?	Changed.
3	page 13, line 15/16. Without adversely impacting which outcomes? Suggest editing this to say "...shortened length of stay without increasing readmission rates" (or whatever the outcomes were).	Specified readmissions and mortality

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3	page 13, line 16-19. Suggest not starting this sentence with the strength of evidence grade (but rather the conclusion of the study). As written, it is unclear.	Agree, changed.
3	page 14, line 48. The sub-header here is "telephone based interventions"; I think this should be edited. The paragraph also seems to include telemonitoring interventions; maybe change to "technology based" or "Telephone-based and telemonitoring interventions." Also, I'm not sure that this paragraph captures the uncertainty in benefit of structured telephone support vs. telemonitoring for HF in reducing early readmissions. One review cited appear to have lumped these together. Others (like ours) split them apart and found no benefit for telemonitoring (for reducing early readmissions or mortality). I believe the Cochrane review focused on outcome timings > 6 months after an index admission; if so, this should be noted. Some would say that "re"admissions > than 6 months after an index hospitalization don't have much to do with the quality of care transitions. Is there a reason why the more recent Cochrane review is not cited here? See comment above.	Agree. We have substantially revised this section and changed the subheading according. We distinguished the two interventions and noted the uncertainties in the evidence. We looked at the 2008 Cochrane review, but it did not focus on TM interventions after discharge and therefore seemed less directly applicable to our review than the reviews chosen.
3	page 14. line 23-26: I think it may be misleading to call out this one head to head trial of telemonitoring vs. a home visit. I don't have the full review in front of me, but I think this trial may have been rated high risk of bias (and the results here are not consistent with other telemonitoring trials...). Consider editing to state that there was insufficient evidence to make a conclusion on the comparative efficacy of intervention types (or something along these lines).	Agree, changed accordingly.
3	page 14, line 30: I was surprised to suddenly see "hospital at home" interventions. The background/methods did not make it clear that these types of interventions would be included (although I could have missed this). I think this is a different strategy than transitional care interventions; both aim to reduce utilization rates, but I think some would say that the applicability (and perhaps patient populations) are quite different and that these intervention types should not be lumped together. One focuses on an alternative to acute care, while transitional care interventions focus on a different set of processes.	We note that the purpose of these interventions was often to substitute home care for part of a hospitalization, but also note that results did not vary according to the degree of “admission substitution”. While we agree hospital-at-home interventions are probably different from other types of transitions interventions, there is substantial overlap (post-d/c home visits, pt education, bridging element) and we would argue the patient populations targeted (older patients with chronic illness) are often the same populations targeted in other TC interventions. Furthermore, these interventions are often, at least in VA, brought up in the TC discussions and are relevant to TC related policy discussions.

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3	Page 15, line 60. I'm not sure the authors of this review need to add a disclaimer about the VA trials finding an increased risk of readmissions (the sentence starting with "However...."). We don't know if these system-wide changes would have necessarily affected the results of those trials. If I remember correctly, the intervention in the trial by Oddone et. al. had some of the features of a medical home. I would just leave the sentence out, or instead add some of the reasons the authors of those trials cite as explanations for the increased rate of readmissions.	Agreed, we don't know how this would impact readmissions and there have been a number of system wide changes to all the systems studied.
3	Page 16, line 55. Selection of higher risk populations would only increase statistical power in trials if we could correctly identify patients at higher risk. This sentence seems out of place. My sense is that trials have focused on specific populations (such as HF) because this condition itself is associated with a high proportion of Medicare hospitalizations and 30-day readmissions. And because there is some data to indicate that these readmissions are potentially preventable. The use of risk-prediction tools seems like a separate issue.	We deleted the sentence about statistical power. We clarified some of the other language in order to better distinguish the use of simple inclusion criteria from risk prediction in identifying the study population. We believe the issue is relevant to TC discussions as one of the main purported uses of risk prediction tools has been to identify patients for intervention. There has been at least one quasi-experimental study in CHF patients using a risk prediction tool to identify intervention patients. The issue comes up frequently and we believe the relative lack of empiric data examining this approach in an intervention context is worth noting.
3	Page 19, line 55. The term "sabotage" sounds very colloquial within this report. Consider revising and focusing on quality of patient hand-off from hospital to home, or ensuring close follow-up. The terms "sabotage" and "missed" sound like there is some well defined formula that needs to be followed.	Agree, changed.
3	Policy Implications: How would a VA hospital know that they needed to address transitional care? Is this map intended as a checklist for all hospitals to sort of inventory overall quality in transition processes. Or is intended for hospitals that have a higher than expected readmission rate for certain conditions (e.g., HRRP covered conditions)?	We anticipated it being used by all institutions regardless of current performance. We have added clarification and an explanation here.
3	Page 21, line 45.I would be careful about using "high-risk" here. Seems like the previous section concluded that there was no evidence to support a risk-based approach to targeting patients who receive transitional care interventions. HBPC programs would certainly be able to provide in-person care following an admission for patients already enrolled. I wonder if one of the VA home-based care trials have reported data on readmission rates? If so, I would mention that here. Many VAs (or larger VAs) also have a heart failure specialty clinic that can identify patients during an inpatient admission and arrange close follow-up.	Agree – we have taken out that term and we've added a recent reference to the impact of HBPC on hospitalization rates. We appreciate the suggestion re: CHF clinics and have added this.

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3	Page 22-23; The section on risk-prediction is long (compared to other sections) given that the authors note the incremental benefits are unclear and the problems noted with implementation. Seems like this is more of a "research gap"- testing the external validity/ feasibility and effectiveness of various tools in VA settings.	While the point is well taken, we have decided to keep the section in as the question of risk assessment comes up very frequently in policy discussions and we felt it important to clarify the different approaches to risk assessment, acknowledging the gaps in evidence.
3	Page 25, starting at page 46. I may be biased or missing some other review that found benefit, but I would disagree that using telemonitoring/transfer of physiologic data is a useful adjunct to preventing early readmissions for people with HF (without other intervention components). This paragraph seems to paint these interventions in too positive a light.	This was meant to refer to the STS interventions which were associated with long-term readmissions risk reduction. We changed the wording to emphasize the periodic contact by trained nurses (rather than the physiologic data) and we have clarified that the impact was on long-term readmissions. We have tried to be circumspect in the language, but there is at least some promising data in support of the STS interventions in CHF patients and the VA especially has reasons to value telephone-based interventions.
3	Page 27, line 19-20. I don't think PCORI was spelled out previously in this report.	Thanks - changed
3	Page 27, line 41-42. I'm not sure what "transition into the hospital" means. Is this about understanding the reasons for admissions? This is more challenging in some ways then looking at readmissions, and likely varies more by condition (compared with transition to home).	We edited to clarify that this is about communication between outpatient and inpatient teams at the proximal end of hospital stay – clarified that this is simply a poorly understood, but potentially important, area for further investigation. Agree it may be a challenging area to investigate, but in our opinion was still important to acknowledge.
3	Limitations section: I would note that reviews focused on different outcome timings (and trials mentioned had different readmission outcome timings). Interventions showing efficacy at 6 months may not prevent early readmissions.	Agree, changed accordingly
4	In general, I love your writing. I was however waiting for the big bang of what I would walk away with... everything seemed to not demonstrate a whole lot, weak evidence, so whats a	We acknowledge the need to provide some practical recommendations. We

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	reader to do? You make recommendations about a model that touches many points of care "peri discharge", but what models do that? I know RED does, but will all your readers know that? Overall, impressive! Just know that your readers are likely well informed on transitions and will be looking for the magic pill, we don't have that, but we could offer some guidance or just make it more clear. Very proud of your work!	have strived to do this within the constraints of the available evidence. We have edited the discussion to provide some more guidance on use of the map and we have included references to documents such as the NTOCC report that detail QI strategies institutions might use. While we would have loved to be able to identify an easy answer to fixing transitional care, we simply could not find one. But we would argue a shared understanding of the current evidence base is useful in guiding future discussions, even if there are many evidence gaps.
5	I agree that the current post-discharge calls should be critically evaluated but their purpose is not necessarily to reduce utilization or improve outcomes. This is partially addressed on p. 26, lines 28-37, but in a speculative way. Perhaps it could be clearer that this review was confined to reviews using readmissions as outcomes (in the title?) and that the conclusions reflect that focus.	We have specified our inclusion criteria in the methods. We added that our review focuses on readmissions and mortality outcomes in the objectives paragraph in both ES and main report. We also acknowledge this issue in the Limitations section.
6	I didn't understand the attachment describing the Map you developed that facilities could use for doing a gap analysis. A little more instruction on the form would be helpful	We've added some more explanation to the corresponding section of the discussion, as well as a reference to the NTOCC report which provides greater detail about specific QI methodology.
7	This ESP review speaks to the complexity of evaluating much of the transition literature. The lack of effectiveness of most of the interventions evaluated speaks to this complexity. This review clearly speaks to this issue.	Noted
8	There is a noticeable paucity of discussion of metrics for transitional care. While the report calls into question the use of readmissions alone as a metric (appropriately so) it alludes to other utilization measures but not enough attention is paid to other outcome and process measures (page 23-24). Most dramatically absent is the need to assess adverse events associated with inadequate transitions. Falls with injuries, delayed or missed diagnosis due to diagnostic study results not	We agree and appreciate these suggestions. We have added a discussion of patient safety to the outcomes section and added a reference to the global trigger tool.

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	being followed up or recommended testing not being completed, nosocomial infections, morbidity from inadequate home health arrangements, etc. do not register on the 30d readmission metric but are poor outcomes with high impact to patients and resources. There are published process measures and outcome measures in addition to utilization measures. The NTOCC (National Transitions of Care Coalition) defines various measures categories (structure, process, outcomes). This is a start but probably not the best paradigm for measuring transitional care. Additionally, the global trigger tool as a mechanism for capturing adverse events was not examined. Utilization measures (readmissions, ED visits, etc.) are based on financial outcomes for CMS first, and patient outcomes second. They are not adequate for addressing the enormity of health outcomes that suffer from inadequate transitions. Mortality is a balancing measure for readmissions. In the case of heart failure, if an institution has a high readmission rate but a lower than average mortality rate, the case can be made for enhanced access as a contributing factor.	
8	Was the SHM BOOST data included in the studies that were reviewed? BOOST data was published in 2013 and I wasn't sure if it was included in the analysis. Their emphasis on QI methodology as a way to improve transitional care is an important consideration.	We are aware of this observational study, but since this was a review of reviews we did not formally include individual studies that were not included in reviews (and this study would not have been included in recent systematic reviews most of which examined only trials). We agree that a complete discussion of TC improvement needs to acknowledge QI methods that can be used to affect change. Such a discussion is beyond the scope of this review, but we have added a sentence to the discussion about the TC map that acknowledges this gap and references the NTOCC report.