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Reducing Hospital Readmissions: *A Review of the Evidence*

The Washington State Legislature directed the Washington State Institute for Public Policy (WSIPP) to "calculate the return on investment to taxpayers from evidence-based prevention and intervention programs and policies."[1] Additionally, WSIPP's Board of Directors authorized WSIPP to work on a joint project with the MacArthur Foundation and the Pew Charitable Trusts to extend WSIPP's benefit-cost analysis to certain health care topics.

As part of the Pew-MacArthur Results First Initiative, identifying policies that can reduce hospital readmissions was determined to be an important health care topic for states. One important goal is to determine the extent to which programs can reduce readmissions and help states control Medicaid and other health care costs.

This report examines evidence for the effectiveness of "transitional care" services in reducing hospital readmissions.[2] In a subsequent report, WSIPP will present benefit-cost results for these and other health care interventions.

Summary

WSIPP's Board of Directors authorized WSIPP to work on a joint project with the MacArthur Foundation and the Pew Charitable Trusts to extend WSIPP's benefit-cost analysis to certain health care topics. The Pew-MacArthur Results First Initiative identified the goal of reducing hospital readmissions as an important health care challenge for states.

For this report, we reviewed the national and international evaluation literature to determine whether transitional care programs have been shown to reduce hospital readmissions. Components of transitional care include coaches, patient education, medication reconciliation, individualized discharge planning, enhanced provider communication, and patient follow-up after discharge.

We find that, on average, transitional care programs reduce hospital readmissions. Comprehensive programs that include both pre- and post-discharge services and programs that target higher-risk, elderly, and chronically ill patients appear to be especially effective. For example, we find that the average comprehensive program in the US could reduce readmission rates for higher-risk patients from 22% to 15%.

In a subsequent report, WSIPP will present benefit-cost results for these programs, assessing the extent to which they could help states control Medicaid and other health care costs.

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[1] Engrossed Substitute House Bill 1244, Section 610(4), Chapter 564, Laws of 2009.

[2] These results have been summarized in a December 2014 WSIPP report: Bauer, J., Kay, N., Lemon, M., & Morris, M. (2014). *Interventions to promote health and increase health care efficiency: A review of the evidence*, (Doc. No. 14-12-3402). Olympia: Washington State Institute for Public Policy.

I. Background

Hospital readmissions are common and costly. According to the federal Agency for Healthcare Research and Quality (AHRQ), in 2011, about 14.7% of all hospital stays resulted in re-admissions among adult patients in the US. These readmissions were associated with about $41.3 billion in hospital costs—about $12,500 per readmission.[3] Exhibit 1 displays national hospital readmission rates.

Not all readmissions are preventable but many apparently are. The federal Medicare Payment Advisory Commission estimates that three quarters of readmissions among Medicare beneficiaries may be avoidable, accounting for $12 billion in excess health care costs.[4]

Several factors appear to contribute to avoidable readmissions. At the health care system level, inadequate communication between providers, poor patient education, a lack of continuity of care, and limited access to services have been found to be important.[5] At the patient level, readmission rates are higher among those with chronic conditions, functional deficits, cognitive impairments, and emotional problems. According to one study, older patients with heart failure have the highest readmission rates.[6]

Exhibit 1

US Hospital Readmission Rates: 2011

Insurance type	Number of readmissions	Percent of admissions that were readmitted*
Medicare Adults, age 65+	1,800,000	17.2%
Medicaid Adults, age 18-64	700,000	14.6%
Privately insured Adults, age 18-64	600,000	8.7%
Uninsured Adults, age 18-64	200,000	10.6%
Total (adults, age 18+)	3,300,000	14.7%

*30-day all-cause readmission rate.
Source: AHRQ, 2014.

[3] Agency for Healthcare Research and Quality, 2014.
[4] Hansen et al., 2011.
[5] Naylor et al., 2004.
[6] Ibid.

Since October 2012, the Centers for Medicare and Medicaid Services have imposed financial penalties for hospitals with higher than expected 30-day readmission rates among Medicare enrollees.

In Washington State, hospitals have the opportunity to earn incentive payments for actions taken to reduce readmissions under the Medicaid Quality Incentive Program, administered by the Washington State Health Care Authority.[7]

This report examines evidence for the effectiveness of transitional care services in reducing hospital readmissions. These services include coaches, patient education, medication reconciliation, individualized discharge planning, scheduling follow-up provider visits, provider communication, and telephone and home visit follow-up.[8]

[7] Incentives reward efforts to share discharge information with primary care providers and for phone follow-up with discharged patients with certain conditions. Targeted conditions include acute myocardial infarction, heart failure, pneumonia, chronic obstructive pulmonary disease, and stroke.

[8] Hansen et al., 2011.

II. Research Methods

When WSIPP carries out study assignments from the legislature to identify what works in public policy, we implement a set of standardized procedures. We analyze all available high-quality studies to identify program effects. We look for research studies with strong evaluation designs and exclude studies with weak research methods.

Given the weight of the evidence, we calculate an average expected effect ("effect size") of a policy on a particular outcome of interest and estimate of the margin of error for that effect.

An effect size measures the degree to which a program has been shown to change an outcome (such as hospital readmissions) for program participants relative to a comparison group. Our methodology is described in detail in WSIPP's Technical Documentation.[9]

We searched for studies in PubMed, Google Scholar, and the Cochrane Library. After examining abstracts, we conducted full reviews of 142 studies, and 30 were included in the meta-analysis. These studies: (a) met our methodological requirements; (b) reported all-cause hospital readmission rates for one to three months after discharge;[10] (c) included patients discharged to home rather than a nursing facility; and (d) excluded pediatric, obstetric, and psychiatric patient populations.

Among the selected studies, 29 were randomized controlled trials, and one had a quasi-experimental design. Half the studies were from countries other than the US.

[9] Mean effects are derived using inverse variance weights, and adjustments are made for clustering when studies do not do so. For a discussion of WSIPP's study selection criteria and meta-analysis methodology, please refer to the following report. Washington State Institute for Public Policy, *Benefit-Cost Technical Documentation Washington State Institute for Public Policy Benefit-Cost Model,* August 2014. http://www.wsipp.wa.gov/TechnicalDocumentation/WsippBenefitCostTechnicalDocumentation.pdf

[10] Most studies (20) report 30-day rates, which is the current policy focus in the US.

III. Meta-Analysis Findings

Transitional care programs vary in terms of intervention services and patient populations. In terms of services, we categorized programs as "comprehensive" or "post-discharge only."[11] Comprehensive interventions include pre-discharge assistance (e.g., a coach, enhanced discharge planning, and primary care provider communication) and post-discharge services. Post-discharge interventions include only patient assistance after release from the hospital.

Many of these programs recruit high-risk, elderly, or chronically ill patients. Others recruit from general populations of admitted patients, without regard to age or medical condition.[12]

In all, we located 30 rigorous evaluations of transitional care programs.[13] We find that these programs can reduce hospital readmissions (Exhibit 2). For example, the average program could reduce readmission rates from 14.7% to 11.8%.

Programs in the US have larger mean effects than those based in other countries. This is partially due to the mix of intervention types and recruited patient populations. Studies outside the US are less likely to evaluate comprehensive programs and are more likely to recruit non-chronically ill, elderly patients. Differences in health care systems may also contribute to differences in program effects across countries.[14]

Our analysis of intervention types focuses on studies conducted in the US. Transitional care programs in the US typically recruit high-risk, elderly, and/or chronically ill patients (with chronic heart disease, coronary artery disease, diabetes, and stroke). Fewer studies recruit from general populations of admitted patients.

Exhibit 3 and Exhibit 4 present mean effect sizes for US studies by intervention type and patient population.[15] We find that transitional care programs can reduce hospital readmissions, especially the comprehensive programs and those that target high risk patients.[16] For example, the typical comprehensive program reduced readmission rates from a base of 22% down to 15%.

[11] Six studies did not fall into these categories. Two studies reported on interventions with only pre-discharge services (treatment review and patient education). Four non-US studies examined other specific services that were difficult to categorize (e.g., follow-up at a clinic, pharmacist only interventions).

[12] See Appendix Exhibit A1 for study descriptions and citations.

[13] The 30 included studies produced a total of 32 effect sizes.

[14] Jaarsma et al., 1999 and Shepperd et al., 2013. We used weighted OLS regression to examine the effects of US versus non-US study location, controlling for one versus three-month readmission rate measurement, phone versus home visit follow-up, and participant population (elderly, chronic, and general) on study effect sizes. The analysis included 15 studies of comprehensive interventions. Study location was found to be the only significant factor determining effect sizes.

[15] We use an intraclass correlation coefficient (ICC) of 0.01 to adjust estimates for studies that do not take participant clustering into account. This ICC is based on estimates reported by Kul et al., 2014; Li et al., 2012; and Singh et al. 2013. Sensitivity analysis, allowing the ICC to vary between 0.01 and 0.05, suggests that most inferences are not sensitive to choice of ICC. Note that a higher ICC value does increase the size and statistical significance for the mean effect size of post-discharge only interventions, though the effect remains smaller than that for comprehensive programs.

[16] We could not assess the relative effectiveness of home versus phone follow-up because of differences in patient populations across studies.

Other reviews of the literature have found similar evidence indicating that transitional care programs do reduce readmission rates.[17]

Exhibit 2

Transitional Care Effects on Readmissions: All, US, and Non-US Studies

Location	Average effect size	Standard error	p-value	Number of effect sizes	Number in treatment groups
All	-0.152	0.041	0.000	32	4901
US	-0.205	0.056	0.000	17	2590
Non-US	-0.091	0.060	0.125	15	2311

Exhibit 3

Transitional Care Effects on Readmissions: US Studies by Intervention Type

Intervention type	Average effect size	Standard error	p-value	Number of effect sizes	Number in treatment groups
Comprehensive*	-0.289	0.061	0.000	11	1,597
Post-Discharge**	-0.143	0.089	0.107	5	750

* Includes pre- and post-discharge services (coaches, patient education, enhanced discharge planning, primary care physician communication, and home or phone follow-up).
** Includes only post-discharge home or phone follow-up.

Exhibit 4

Transitional Care Effects on Readmissions: US Studies by Patient Population

Patient Population	Average effect size	Standard error	p-value	Number of effect sizes	Number in treatment groups
High risk*	-0.278	0.060	0.000	12	1,375
General	-0.155	0.107	0.147	4	972

* High-risk populations include the elderly and/or chronically ill.

[17] See Leppin et al., 2014 and Naylor et al., 2011.

IV. Conclusion

After systematically reviewing the available evaluation literature, we find that transitional care programs can reduce hospital readmissions. We found larger effects for comprehensive programs that include both pre- and post-discharge services and programs that target higher-risk patients.

In a subsequent report, WSIPP will present benefit-cost results for transitional care programs, assessing the extent to which they could help Washington State control Medicaid and other health care costs.

Exhibit A1

Characteristics of Studies Included in WSIPP's Meta-Analysis of Transitional Care Programs

Study	Locations	Treatment group size	Readmission effect size	Intervention type	Intervention components	Patient category	Study recruitment criteria
Balaban et al., 2008	US	47	0.024	comprehensive	coach, enhanced DP, PCP communication, phone (1)	no age/condition criteria	general (drawn from a safety net system)
Bostrom et al., 1996	US	445	0.062	post-discharge only	phone follow-up only (1+)	no age/condition criteria	general (no age, risk, or condition restrictions)
Brand et al., 2004	Australia	83	0.000	comprehensive	coach; enhanced DP, PCP communication, follow-up visit at clinic within 2 weeks	elderly and chronic	65+ with at least one of following: prior admission in last 6 months, 2+ comorbidities, CHF (and not COPD)
Braun et al., 2009	Israel	153	-0.044	post-discharge only	phone follow-up only (2) (usual care and treatment groups had detailed discharge reports and instructions)	no age/condition criteria	general admissions with stays of 2+ days
Coleman et al., 2006	US	379	-0.320	comprehensive	coach, enhanced DP, PCP communication, phone follow-up (3), home visit (1)	elderly and chronic	elderly (65+) with selected diagnoses (CHF,COPD,CAD,diabetes,stroke,back,hip,vascular disease)
Coleman et al., 2004	US	158	-0.396	comprehensive	coach, enhanced DP, PCP communication, PCP follow-up, phone follow up (3+), home visits (1)	elderly and chronic	elderly (65+) with selected diagnoses (CHF,COPD,CAD,diabetes,stroke,back,hip,vascular disease)
Dudas et al., 2001	US	110	-0.384	post-discharge only	phone follow-up only (1) by a pharmacist	no age/condition criteria	general; no restrictions by age or risk; had to have had counseling on discharge prescriptions)
Dunn et al., 1994	United Kingdom	102	0.085	post-discharge only	home visit (1) by health visitor (only intervention)	elderly	geriatric admissions 65+
Einstadter et al., 1996	US	243	0.232	pre-discharge only	coach, enhanced DP, PCP follow-up (no post discharge follow-up)	no age/condition criteria	all medical admissions (no restrictions by age or risk of readmission or chronic condition)
Forster et al., 2005	Canada	157	0.241	comprehensive	coach (nurse), enhanced DP, phone follow-up (1)	no age/condition criteria	general admissions
Harrison et al., 2002	Canada	92	-0.246	comprehensive	coach (nurse), enhanced DP (especially evidence-based education), phone follow-up (2+), hospital nurse consults with community (home) nurse	chronically ill	CHF admissions
Huang et al., 2005	Taiwan	63	-0.809	comprehensive	coach (nurse), enhanced DP, phone follow-up (12 - one per week), home visit (1)	acute/other high risk	elderly 65+ with hip fractures
Jaarsma et al., 1999	Netherlands	84	-0.100	other	structured patient education; phone follow-up (1), home visit (1)	elderly and chronic	patients age 50+ admitted for heart failure
Jack et al., 2009	US	370	-0.242	comprehensive	coach, enhanced DP, PCP communication, phone follow-up (1)	no age/condition criteria	general, no SNF
Kwok et al., 2004	Hong Kong	70	0.249	comprehensive	coach, enhanced DP, home visits (10)	elderly and chronic	patients age 60+ admitted for chronic lung disease

Study	Locations	Treatment group size	Readmission effect size	Intervention type	Intervention components	Patient category	Study recruitment criteria
Laramee et al., 2003	US	131	0.000	comprehensive	coach, enhanced DP, PCP communication, phone (9), promotion of optimal CHF medications	chronically ill	CHF as primary or secondary admission diagnosis and at risk for readmission (based on history of CHF, knowledge deficits of treatment plan, ongoing lack of adherence, previous CHF admission, living alone)
Legrain et al., 2011	France	317	-0.272	pre-discharge only	comprehensive treatment review (focusing on adverse drug reactions, depression, and malnutrition),education, transition-of-care communication(with PCPs, etc.)	elderly	patients 70+ admitted to geriatric units
McDonald et al., 2002	Ireland	51	-0.719	heart failure clinic	Specialist-led patient education, dietician consults, phone follow-up (13), HF clinic visits (2)	chronically ill	HF admissions
Naylor et al., 1994	US	72	-0.468	comprehensive	coach, enhanced DP, PCP communication, phone (2+)	elderly and chronic	70+ admitted for CHF, Angina/MI, coronary bypass, cardiac valve replacement (medical admissions)
Naylor et al., 2004	US	118	-0.521	comprehensive	coach, enhanced DP, PCP communication, home visits (8+), evidence based protocol for heart failure	elderly and chronic	65+ admitted with diagnosis of heart failure
Nazareth et al., 2001	United Kingdom	171	-0.005	pharmacist led	pharmacist assessment and discharge plan; copy of plan shared with GP; home visit by pharmacist (1)	elderly	patients 75+ taking 4+ medications
Parry et al., 2009	US	49	-0.608	comprehensive	coach, enhanced DP, PCP communication, phone (3), home (1)	elderly and chronic	elderly (65+), Medicare FFS, 11 diagnoses (stroke,CHF,CAD,COPD, diabetes, spine,hip,vascular,pulmonary)
Rich et al., 1993	US	63	-0.314	comprehensive	coach, enhanced DP, phone(# not reported), home(# not reported, at least 4)	elderly and chronic	70+ admitted to hospital, diagnosed with CHF, at moderate to high risk for readmission (based on 4 criteria--see page 586)
Rich et al., 1995	US	142	-0.352	comprehensive	coach, enhanced DP, phone(# not reported), home (# not reported, at least 4)	elderly and chronic	70+ admitted to hospital, diagnosed with CHF, at moderate to high risk for readmission (based on 4 criteria--see page 1190)
Riegel et al., 2002	US	35	-0.303	post-discharge only	phone follow-up (17), PCP communication	chronically ill	Hispanics admitted with HF
Riegel et al., 2006	US	69	-0.168	post-discharge only	phone follow-up (13.5), PCP communication	chronically ill	Hispanics admitted with HF
Shyu et al., 2005	Taiwan	66	-0.336	comprehensive	enhanced DP; geriatric consultation; rehabilitation program (including both inpatient and 8 home visits)	acute/other high risk	patients 60+ admitted for hip fracture
Townsend et al., 1988	United Kingdom	464	0.000	post-discharge only	home visit by care attendant (first day and 12 hours/week for 2 weeks)	elderly	admitted patients 75+
Wong et al., 2008	Hong Kong	166	-0.063	post-discharge only	home visit by community nurse (1 during first week; additional 4 could be arranged if issues not addressed)	acute/other high risk	high risk group—prior admission within last 28 days; respiratory, cardiac, or renal condition
Wong et al., 2011	Hong Kong	272	-0.171	post-discharge only	phone follow-up (2 by nurse case manager); home visits (1 by nurse; 1 by trained volunteer); volunteer focus on social supports	elderly	admitted patients 60+

DP=Discharge planning
PCP=Primary care physician
CHF=Congestive heart failure
COPD=Chronic obstructive pulmonary disease
CAD=Coronary artery disease
MI=Myocardial infarction

A2. Studies Included in the Meta-Analysis

Balaban, R. B., Weissman, J. S., Samuel, P. A., & Woolhandler, S. (January 01, 2008). Redefining and redesigning hospital discharge to enhance patient care: a randomized controlled study. *Journal of General Internal Medicine, 23* (8), 1228-33.

Bostrom, J., Caldwell, J., McGuire, K., & Everson, D. (January 01, 1996). Telephone follow-up after discharge from the hospital: does it make a difference? *Applied Nursing Research: ANR, 9* (2), 47-52.

Brand, C. A., Jones, C. T., Lowe, A. J., Nielsen, D. A., Roberts, C. A., King, B. L., & Campbell, D. A. (January 01, 2004). A transitional care service for elderly chronic disease patients at risk of readmission. *Australian Health Review: a Publication of the Australian Hospital Association, 28* (3), 275-84.

Braun, E., Baidusi, A., Alroy, G., & Azzam, Z. S. (January 01, 2009). Telephone follow-up improves patients satisfaction following hospital discharge. *European Journal of Internal Medicine, 20,* 2, 221-225.

Coleman, E. A., Parry, C., Chalmers, S., & Min, S. J. (January 01, 2006). The care transitions intervention: results of a randomized controlled trial. *Archives of Internal Medicine, 166* (17), 1822-8.

Coleman, E. A., Smith, J. D., Frank, J. C., Min, S.-J., Parry, C., & Kramer, A. M. (November 01, 2004). Preparing Patients and Caregivers to Participate in Care Delivered Across Settings: The Care Transitions Intervention. *Journal of the American Geriatrics Society, 52* (11), 1817-1825.

Dudas, V., Bookwalter, T., Kerr, K. M., & Pantilat, S. Z. (January 01, 2001). The impact of follow-up telephone calls to patients after hospitalization. *The American Journal of Medicine, 9* (111), 26-30.

Dunn, R. B., Lewis, P. A., Vetter, N. J., Guy, P. M., Hardman, C. S., & Jones, R. W. (January 01, 1994). Health visitor intervention to reduce days of unplanned hospital re-admission in patients recently discharged from geriatric wards: the results of a randomised controlled study. *Archives of Gerontology and Geriatrics, 18* (1).

Einstadter, D., Cebul, R. D., & Franta, P. R. (January 01, 1996). Effect of a nurse case manager on postdischarge follow-up. *Journal of General Internal Medicine, 11* (11), 684-8.

Forster, A. J., Clark, H. D., Menard, A., Dupuis, N., Chernish, R., Chandok, N., Khan, A., ... van, W. C. (October 01, 2005). Effect of a nurse team coordinator on outcomes for hospitalized medicine patients. *The American Journal of Medicine, 118* (10), 1148-1153.

Hansen, F. R., Poulsen, H., & Sørensen, K. H. (1995). A model of regular geriatric follow-up by home visits to selected patients discharged from a geriatric ward: a randomized controlled trial. *Aging (Milan, Italy), 7* (3), 202.

Harrison, M. B., Browne, G. B., Roberts, J., Tugwell, P., Gafni, A., & Graham, I. D. (2002). Quality of life of individuals with heart failure: a randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical care, 40* (4), 271-282.

Holland, R., Lenaghan, E., Harvey, I., Smith, R., Shepstone, L., Lipp, A., Christou, M., ... Hand, C. (January 01, 2005). Does home based medication review keep older people out of hospital? The HOMER randomised controlled trial. *Bmj : British Medical Journal, 330* (7486), 293.

Huang, T.-T., & Liang, S.-H. (November 01, 2005). CARE OF OLDER PEOPLE: A randomized clinical trial of the effectiveness of a discharge planning intervention in hospitalized elders with hip fracture due to falling. *Journal of Clinical Nursing, 14,* 10, 1193-1201.

Jaarsma, T., Halfens, R., Abu-Saad, H. H., Dracup, K., Gorgels, T., Van Ree, J., & Stappers, J. (1999). Effects of education and support on self-care and resource utilization in patients with heart failure. *European Heart Journal, 20* (9), 673-682.

Jack, B. W., Chetty, V. K., Anthony, D., Greenwald, J. L., Sanchez, G. M., Johnson, A. E., Forsythe, S. R., ... Culpepper, L. (January 01, 2009). A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. *Annals of Internal Medicine, 150* (3), 178-87.

Kwok, T., Lum, C. M., Chan, H. S., Ma, H. M., Lee, D., & Woo, J. (August 01, 2004). A Randomized, Controlled Trial of an Intensive Community Nurse-Supported Discharge Program in Preventing Hospital Readmissions of Older Patients with Chronic Lung Disease. *Journal of the American Geriatrics Society, 52* (8), 1240-1246.

Laramee, A. S., Levinsky, S. K., Sargent, J., Ross, R., & Callas, P. (January 01, 2003). Case management in a heterogeneous congestive heart failure population: a randomized controlled trial. *Archives of Internal Medicine, 163* (7), 809-17.

Legrain, S., Tubach, F., Bonnet-Zamponi, D., Lemaire, A., Aquino, J. P., Paillaud, E., Taillandier-Heriche, E., ... Lacaille, S. (January 01, 2011). A new multimodal geriatric discharge-planning intervention to prevent emergency visits and rehospitalizations of older adults: the optimization of medication in AGEd multicenter randomized controlled trial. *Journal of the American Geriatrics Society, 59* (11), 2017-28.

McDonald, K., Ledwidge, M., Cahill, J., Quigley, P., Maurer, B., Travers, B., Ryder, M., ... Ryan, E. (January 01, 2002). Heart failure management: multidisciplinary care has intrinsic benefit above the optimization of medical care. *Journal of Cardiac Failure, 8* (3), 142-8.

Naylor, M., Brooten, D., Jones, R., Lavizzo-Mourey, R., Mezey, M., & Pauly, M. (1994). Comprehensive discharge planning for the hospitalized elderlya randomized clinical trial. *Annals of internal Medicine, 120* (12), 999-1006.

Naylor, M. D., Brooten, D., Campbell, R., Jacobsen, B. S., Mezey, M. D., Pauly, M. V., & Schwartz, J. S. (January 01, 1999). Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *Jama : the Journal of the American Medical Association, 281* (7), 613-20.

Naylor, M. D., Brooten, D. A., Campbell, R. L., Maislin, G., McCauley, K. M., & Schwartz, J. S. (May 01, 2004). Transitional Care of Older Adults Hospitalized with Heart Failure: A Randomized, Controlled Trial. *Journal of the American Geriatrics Society, 52* (5), 675-684.

Nazareth, I., Burton, A., Shulman, S., Smith, P., Haines, A., & Timberal, H. (January 01, 2001). A pharmacy discharge plan for hospitalized elderly patients--a randomized controlled trial. *Age and Ageing, 30* (1), 33-40.

Oddone, E. Z., Weinberger, M., Giobbie-Hurder, A., Landsman, P., & Henderson, W. (January 01, 1999). Enhanced access to primary care for patients with congestive heart failure. Veterans Affairs Cooperative Study Group on Primary Care and Hospital Readmission. *Effective Clinical Practice : Ecp, 2* (5).

Parry, C., Min, S. J., Chugh, A., Chalmers, S., & Coleman, E. A. (January 01, 2009). Further application of the care transitions intervention: results of a randomized controlled trial conducted in a fee-for-service setting. *Home Health Care Services Quarterly, 28,* 2-3.

Rich, M. W., Vinson, J. M., Sperry, J. C., Shah, A. S., Spinner, L. R., Chung, M. K., & Davila-Roman, V. (January 01, 1993). Prevention of readmission in elderly patients with congestive heart failure: results of a prospective, randomized pilot study. *Journal of General Internal Medicine, 8* (11), 585-90.

Rich, M. W., Beckham, V., Wittenberg, C., Leven, C. L., Freedland, K. E., & Carney, R. M. (November 02, 1995). A Multidisciplinary Intervention to Prevent the Readmission of Elderly Patients with Congestive Heart Failure. *New England Journal of Medicine, 333* (18), 1190-1195.

Riegel, B., Carlson, B., Glaser, D., Kopp, Z., & Romero, T. E. (2002). Standardized telephonic case management in a Hispanic heart failure population. *Disease Management and Health Outcomes, 10* (4), 241-249.

Riegel, B., Carlson, B., Glaser, D., & Romero, T. (April 01, 2006). Randomized Controlled Trial of Telephone Case Management in Hispanics of Mexican Origin With Heart Failure. *Journal of Cardiac Failure, 12* (3), 211-219.

Shyu, Y.-I. L., Liang, J., Wu, C.-C., Su, J.-Y., Cheng, H.-S., Chou, S.-W., & Yang, C.-T. (May 01, 2005). A Pilot Investigation of the Short-Term Effects of an Interdisciplinary Intervention Program on Elderly Patients with Hip Fracture in Taiwan. *Journal of the American Geriatrics Society, 53,* 5, 627-634.

Stewart, S., Pearson, S., & Horowitz, J. D. (January 01, 1998). Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. *Archives of Internal Medicine, 158* (10), 1067-72.

Stewart, S., Marley, J. E., & Horowitz, J. D. (January 01, 1999). Effects of a multidisciplinary, home-based intervention on unplanned readmissions and survival among patients with chronic congestive heart failure: a randomised controlled study. *Lancet, 354*, 1077-83.

Townsend, J., Piper, M., Frank, A. O., Dyer, S., North, W. R., & Meade, T. W. (1988). Reduction in hospital readmission stay of elderly patients by a community based hospital discharge scheme: a randomised controlled trial. BMJ: *British Medical Journal, 297* (6647), 544.

Weinberger, M., Oddone, E. Z., & Henderson, W. G. (January 01, 1996). Does increased access to primary care reduce hospital readmissions? *The New England Journal of Medicine, 334,* 22, 1441-7.

Wong, F. K. Y., Chow, S., Chung, L., Chang, K., Chan, T., Lee, W.-M., & Lee, R. (June 01, 2008). Can home visits help reduce hospital readmissions? Randomized controlled trial. *Journal of Advanced Nursing, 62* (5), 585-595.

Wong, F. K., Ho, M. M., Yeung, S. Y., Tam, S. K., & Chow, S. K. (October 01, 2011). Effects of a health-social partnership transitional program on hospital readmission: A randomized controlled trial. *Social Science & Medicine, 73* (7), 960-969.

A3. Additional References

Agency for Healthcare Research and Quality, (2014). *Conditions with the Largest Number of Adult Hospital Readmissions by Payer, 2011*. Statistical Brief #172.

Hansen, L. O., Young, R. S., Hinami, K., Leung, A., & Williams, M. V. (2011) Interventions to reduce 30-day hospitalization: A systematic review. *Annals of Internal Medicine, 155*(8), 520-528.

James J. (2013). Health Policy Brief: Medicare Hospital Readmissions Reduction Program. *Health Affairs*, November 12, 2013.

Kul, S., Vanhaecht, K., & Panella, M. (2014). Intraclass correlation coefficients for cluster randomized trials in care pathways and usual care: hospital treatment for heart failure. *BMC Health Services Research 14*(1), 84.

Laderman, M.,Loehrer, S., & McCarthy, D. (2013) STAAR issue brief: The effect of Medicare readmissions penalties on hospitals' efforts to reduce admissions: perspectives from the field. Cambridge, MA: Institute for Healthcare Improvement.

Leppin A., Gionfriddo M., Kessler M., Brito, J. P., Mair, F. S., Gallacher, K., et al. (2014). Preventing 30-day hospital readmissions: A systematic review and meta-analysis of randomized trials. *JAMA Intern Med 174*(7), 1095-1107.

Li Z., Amstrong E., Parker J., Danielsen, B., & Romano, P. S. (2012). Hospital variation in readmission after coronary bypass surgery in California. *Circulation: Cardiovascular Quality and Outcomes 5*(5), 729-737.

Mistiaen, P., & Poot, E. (2008). Telephone follow-up, initiated by a hospital-based health professional, for postdischarge problems in patients discharged from hospital to home. *Cochrane Database System Review, 4.*

Naylor, M. D., Aiken, L. H., Kurtzman, E. T., Olds, D. M., & Hirschman, K. B. (2011). The importance of transitional care in achieving health reform. *Health Affairs, 30*(4), 746-754.

Naylor, M. D., Kurtzman, E. T., Grabowski, D. C., Harrington, C., McClellan, M., & Reinhard, S. C. (2012). Unintended consequences of steps to cut readmissions and reform payment may threaten care of vulnerable older adults. *Health Affairs, 31*(7), 1623-1632.

Shepperd, S., Lannin, N. A., Clemson, L. M., McCluskey, A., Cameron, I. D., & Barras, S. L. (2013) Discharge planning from hospital to home. *Cochrane Database System Review, 1.*

Singh, S., Lin, Y., Kuo, Y., Nattinger, A. B., & Goodwin, J. S. (2013). Variation in the risk of readmission among hospitals: The relative contribution of patient, hospital, and provider characteristics. *Journal of General Internal Medicine, 29*(4), 572-578.

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