Appendix Table A1. Summary of the characteristics of the 13 studies.

Year, Region, Citation	Data Source	Study Design	Cohort Definition	Unplanned Readmissions Definition	Analysis Method	Predictor Variables	Risk Factors
2017, USA, [28]	South Carolina Revenue and Fiscal Affairs Office (SCRFA) statewide all payer claims database	Retrospective cohort study	• Study period: 1/1/2008 – 12/31/2014 • Age: 18-100 years • Discharged alive • With complete administrative data • Not transferred to another acute care hospital upon discharge • Not discharged against medical advice • Not admitted for rehabilitation care, fitting of prostheses and adjustment devices • Final cohort size = 2,476,431	Not contain any one of the planned procedures or maintenance chemotherapy or contain an acute illness or a complication of care	• Final model: Multivariate Logistic Regression • Validation: 60% of total observations were used to test the final model and this process was repeated for 100 times • Evaluation: none	Payer, age, gender, race, urban/rural status, length of stay, Elixhauser comorbidity index, the number of comorbidities	• Medicare/Medicaid as insurance • Rural dweller • African American race • Longer stay in the index admission • Higher number of comorbidities
2016, Israel, [26]	• Unplanned readmission data were collected from EHR • At-admission activities of daily living (ADL) and in-hospital ADL decline data were collected with validated questionnaires	Prospective cohort study	• Study period: 2009-2011 • Age: ≥ 70 years • Not cognitively impaired without a caregiver • Not admitted for stroke, coma, or respiratory failure requiring mechanical ventilation • Survived during index admission • Not transferred to another ward • Not discharged to a post-acute care facility • Not dropped-out from the HoPE-FOR study • Without missing data on main variables • Final cohort size = 559	Unplanned readmission data were directly used without a definition	• Final model: Multivariate Logistic Regression • Validation: 100 bootstrap subsampling • Evaluation: Baseline model AUC = 0.81, discharge model AUC = 0.81	• Baseline model: Male gender, living alone, education in years, chronic conditions, number of medications prescribed 1 year before the index admission, APACHE II, number of hospitalizations 1 year before the index admission, risk of malnutrition, serum albumin, at-admission activities of daily living • Discharge model: baseline model variables, in-hospital activities of daily living decline, length of stay	• High or moderate risk of malnutrition • With malignancy • With chronic renal failure • Higher number of admissions 1 year before the index admission • Lower albumin levels • At-admission activities of daily living • In-hospital activities of daily living decline
2016, Singapore, [34]	Clinical and administrative data were extracted from SingHealth's EHR system and Electronic Health Intelligence System	Retrospective cohort study	• Study period: 1/1/2013 – 5/31/2015 • Age: ≥ 21 years • Survived during index admission • Admission specialty was not obstetrics, emergency medicine, dentistry, or ophthalmology • Residents of Singapore • Final cohort size = 74,102	Not in the specialties of obstetrics, dentistry, or ophthalmology	• Final model: Multivariate Logistic Regression • Validation: 10-fold cross-validation • Evaluation: AUC = 0.78 (95% CI: 0.77-0.79)	age, gender, required financial assistance using Medifund, number of visits to the emergency department in the past 6 months, number of admissions 1 year before index admission, index admission was urgent or not, staying in a subsidized ward during index admission or not, required inpatient dialysis during index admission, treatment with intravenous furosemide 40 milligrams or more during index admission, length of stay of index admission, comorbidities (depression, spine fracture, osteoarthritis, and history of alcoholism), and the Charlson comorbidity Index	• Increasing age • Male • Required financial assistance using Medifund • Higher number of admissions 1 year before the index admission • Higher number of emergency department visits 6 months before the index admission • Index admission was urgent • Stayed in a subsidized ward during the index admission • Required inpatient dialysis during the index admission • Treatment with anti-depressants • With depression • Greater Charlson comorbidity index
2016,	Claims data	Retrospective	• Study period: 2008	Hospital admissions	• Final model:	age in year group, marital status,	• Age ≥ 75 years

Taiwan, [29]	were extracted from the National Health Insurance Research Database in Taiwan	cohort study	• Age: ≥ 65 years • Survived during index admission • Not have missing information on sociodemographic variables • Final cohort size = 39,156	without a principle diagnosis of cancer	Multivariate Logistic Regression • Validation: 1/4 of the data were used as the validation data set • Evaluation: AUC in training = 0.655 (95% CI: 0.646-0.664), AUC in validation = 0.653 (95% CI: 0.638-0.669)	education status, comorbidities (COPD, heart disease, diabetes mellitus, cancer, anemia), number of admissions within 1 year before the index date, number of emergency visits within 1 year before the index date	• Education ≤ High school • With COPD • With heart disease • With diabetes mellitus • With cancer • With anemia • Higher number of admissions 1 year before the index admission • Higher number of emergency visits 1 year before the index admission • Received home care services
2015, Sweden, [35]	Inpatient care data were retrieved from the Helsingborg general hospital's billing system PASiS®. Hospital occupancy data were retrieved from an occupancy database. Data on emergency department visits were retrieved from the emergency department information system Patientliggaren®.	Retrospective cohort study	• Study period: 2011-2012 • With a corresponding inpatient admission recorded in PASiS® • Admitted through the main emergency department at index admission • Not transferred to other hospitals during index admission • Discharged from the inpatient setting before 11/30/2012 • Final cohort size = 32,811	Readmissions to the hospital through emergency department within 30 days of discharge	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: • AUC = 0.61 (95% CI: 0.60-0.62)	Inpatient bed occupancy, age group, specialty unit responsible for admitting the patient at index	• Inpatient bed occupancy > 95%
2015, USA, [37]	Patient discharge summary data were extracted from the 2006 California state inpatient dataset	Retrospective cohort study	• Study period: 4/2006-9/2006 • Age: ≥ 50 years • Survived during index admission • Final cohort size = 509,775	The California state inpatient dataset has a variable indicating if the readmission was scheduled or not	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: none	Age, gender, race, insurance, income level, admission history, number of chronic conditions, length of stay (index admission), staffed beds size, ownership, teaching hospital or not, urban or rural, operational margin, Herfindahl Index, primary care provider density, neighborhood college degrees, preventable hospitalization rate	• Age ≥ 80 years • African American race • Medi-Cal as insurance • With admission history • Longer stay in the index admission • Higher number of comorbidities

2015, USA, [30]	Laboratory and administrative data from the EHR systems of the Brigham and Women's Hospital and the Massachusetts General Hospital	Two center observational cohort study	• Study period: 1997 – 2012 • Age: ≥ 18 years • Assigned CPT code 99291 (critical care, first 30–74 min) • Had baseline creatinine measured prior to or at hospital admission • Had a diagnosis-related group (DRG) assigned following hospitalization • Without end-stage renal disease prior to hospital admission • Survived during index admission • Survived within 30 days after discharge • Final cohort size = 62,096	Without any DRG codes in: 001, 075, 105, 109, 110, 113, 120, 209, 263, 315, 336, 410, 462, 478, 515, 517, 518, 527, 533; DRGs for transplantation: 103, 302, 480, 481 495; procedures related to pregnancy: 364, 370, 371, 372, 374, 381; dental procedures: 185, 187; psychiatric issues: 425, 426, 428, 430, 433, 434, 435, 521, and 523.	• Final model: Multivariate Logistic Regression • Validation: The primary analyses was repeated by using a selected propensity score–matched cohort (n = 15,844). • Evaluation: none	RIFLE (Risk, Injury, Failure, Loss of kidney function, and End-stage kidney disease) class, age, gender, race (white vs non-white), patient type (surgical vs medical), Deyo-Charlson comorbidity index, sepsis	• With acute kidney injury • Greater Deyo-Charlson comorbidity index • With sepsis
2013, Singapore, [31]	Data were extracted from an administrative electronic database maintained by the Department of Information Technology, Singapore Health Services Group.	Retrospective cohort study	• Study period: 1/2006 – 12/2010 • Age: ≥ 21 years • Admitted to medical departments • Not in psychiatry ward • Not discharged to nursing homes or other intermediate – long-term care facilities • Survived during index admission • Final cohort size = 127,550	The first admission to the hospital via the emergency department after the index admission	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: AUC = 0.70	Age, gender, race, year of discharge, ICU admission, admission class, LACE group	• Age ≥ 65 years • Admission class > A • LACE score ≥ 10 *
2013, USA, [32]	The demographic and laboratory data were extracted from the EHR of a large urban academic medical center	Retrospective chart review	• Study period: 4 months, exact month and year were not reported • Age: ≥ 18 years • Admitted to one general medicine teaching service • Not transferred to another service • With ≥ 2 hemoglobin values measured during hospitalization • No single discharge diagnosis accounts for > 10 patients • Final cohort size = 314	Unplanned readmission data were directly used without a definition	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: none	Age, male gender, albumin level, number of medical comorbidities, discharge hemoglobin level, hemoglobin change during the index admission	• Low hemoglobin at discharge
2013, USA, [24]	The administrative and clinical data were extracted from EHR of the Brigham and Women's Hospital	Retrospective cohort study	• Study period: 7/1/2009 – 6/30/2010 • Age: ≥ 18 years • Length of stay > 24 hours • Survived during index admission • Not transferred to another acute care facility • Not left against medical advice • Discharged from medical services • Final cohort size = 9,212	Potentially avoidable readmissions were identified using a validated algorithm (SQLape) based on administrative data and then evaluated by 1 of 9 trained senior medical residents	• Final model: Multivariate Logistic Regression, which was converted to a 7-factor predictor score (HOSPITAL score) • Validation: 1/3 of the data were used as the validation data set • Evaluation: AUC in	Hemoglobin at discharge, discharge from an oncology service, sodium level at discharge, procedure during the index admission, index type of admission, number of admissions during the previous year, length of stay	• Low hemoglobin at discharge (< 12 g/dL) • Discharged from an oncology service • Low sodium level at discharge (< 135 mEq/L) • Required procedures during the index admission • Urgent or emergent index admission • Higher number of admissions 1 year before the index admission

					training = 0.69, AUC in validation = 0.71		• Length of index admission ≥ 5 days
2012, Israel, [33]	Hospital administrative data and medical charts from the Emek Medical centre	Retrospective case-control study	• Study period: 1/2009 – 12/2009 • Age: ≥ 18 years • Discharged from and readmitted to general medicine, intensive medical care unit, or intensive cardiac care unit • Not readmitted to surgical units • Not emergency department overnight admissions • The case matching was based on gender, age (in a range of 5 years), and primary diagnosis of the index admission • Final cohort size = 582	Unplanned readmission data were directly used without a definition	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: none	Gender, age groups, marital status, race, specialty of the referring physician, residency, nursing home resident, domestic helper, previous year admission, comorbidities (COPD, chronic kidney disease, congestive heart failure, ischemic heart disease, diabetes mellitus, previous cerebrovascular accident, anemia), number of chronic medications, length of index admission, use of vitamin K antagonists, underlying malignancy	• Nursing home resident • With chronic kidney disease • Length of index admission ≥ 3 days • With admission history in the previous year before the index admission
2012, USA, [27]	The control arms of Project RED and RED-Lit clinical trial data sets	Secondary analysis of the Project RED (Re-Engineered Discharge) and RED-Lit clinical trial data sets	• Study period: 12/2005 – 10/2007 • Age: ≥ 18 years • Admitted to general medical services • English-speaking • Have telephone access • Be able to convey an understanding of study procedures and other consent elements in English • Not on suicide watch • Not transferred from another health facility • Not deaf or blind • Not withdraw consent • Survived during the index admission • Discharged to the community • Not in the intervention group of the RED • and RED-Lit trials • Final cohort size = 703	Not in the specialties of orthopedic surgery, obstetrics and gynecology, otolaryngology, general surgery, or psychiatry	• Final model: Multivariate Poisson Regression • Validation: none • Evaluation: none	Education, gender, marital status, income, race, affiliation with primary care provider, homelessness, depression, frequent utilizer status, age, length of stay, and the Charlson Comorbidity Index, health literacy	• Low health literacy (REALM ≤ 6th grade) • Homeless in the 6 months before the index admission • ≥ 2 admissions 6 months before the index admission
2009, USA, [36]	Administrative data were extracted from Veterans Affairs (VA) Patient Treatment File and VA/Medicare file	Retrospective cohort study	• Study period: 1997 – 2004 • Age: ≥ 65 years • Not transferred or discharged to settings other than home • Survived during index admission • Length of stay ≤ 1 year • Not live in suburban or other intermediate RUCA code areas • With a valid DRG, amenable to MDC grouping • Final cohort size = 3,513,912	Without invalid DRGs 469, 470 or pre-surgical transplantation DRGs 103, 480, 481, 483, 495, 512, 513, 541, 542	• Final model: Multivariate Logistic Regression • Validation: none • Evaluation: none	Age, gender, rurality, length of stay of the index admission, Elixhauser comorbidity index, whether the index admission was in a VA hospital, whether the index admission was itself an unplanned readmission	• Increasing age • Male • Greater Elixhauser comorbidity index • Longer stay in the index admission • Index admission was itself a readmission • Index admission was to a VA hospital • Rural dweller

* The LACE score [25] is an index to predict mortality and hospital readmissions. Because the calculation is based on the length of stay during the index admission, the acuity of the index admission, the Charlson comorbidity index [63], and the number of visits to emergency department during the previous six months before the index admission, it was not considered as an individual predictor and was excluded from further analysis.