

Appendix Table 3. Characteristics of Included Studies from Cohorts with Selection Criteria

Study	Setting	Study Method	Cohort	How AE Determined	Screening Criteria	Definition of AE	How Diagnostic Error Determined	Definition of Diagnostic Error	Included Events Before/After Admission	Inter-rater Reliability	Proportion of Reviews with Harmful Diagnostic error
Leape, 1991	51 hospitals in New York	Retro-spective	Random sample but oversampled high-risk specialties	1.Two stage review 2.MD rates 0-6 scale for causality, $\geq 4=AE$	18 HMPS criteria	1.Injury 2.Caused by health care 3. Measurable disability	Type of AE classified by authors into 11 categories	Improper or delayed diagnosis	Yes before, not after	Kappa 0.61 for AE	79/30,195 admits (0.3%)
Nenner, 1994	New York hospitals	Retro-spective cohort	Convenience sample of New York state Medicaid and Medicare patients	1. Three stage review 2.Second MD determine Y/N AE after getting feedback from providers	NR	Unnecessarily prolonged treatment, complications, readmission or mismanagement that resulted in impairment, disability, or death	Type of AE classified by reviewer into 6 categories	Incomplete or inaccurate diagnosis	Unclear	NR	74/372,000 (0.02%)
Liu, 2002	Single hospital, Australia	Retro-spective	Consecutive admissions to hospital in the home	Two physicians independently rated Y/N AE	n/a	1.Injury 2.Caused by health care 3.Measurable disability, death or prolonged LOS	Type of AE classified by reviewer into 8 categories	NR	Yes, both	NR	2/357 admissions (0.6%)
Tudela, 2002	Single hospital, Spain	Retro-spective	Consecutive admissions from ER	n/a	n/a	n/a	Single reviewer determined Y/N	NR	No	NR	14/302 (4.6%)*
Forster, 2003	Single hospital, Canada	Pro-spective	Consecutive discharges to home from internal medicine	Two independent MD reviewers rated 1-6 for causality, $\geq 4=AE$	n/a	1.Injury 2.Caused by health care	Type of AE classified by reviewer into 6 categories	NR	Not before, yes after [†]	Kappa 0.61 for AE	5/400 discharges (1.3%)
Judez-Legaristi, 2009	Single hospital, Spain	Ambi-spective [‡]	Consecutive surgical admissions	1.Two stage review	19 criteria based on HMPS	1.Damaging physical disorder	Type of AE classified by reviewer	NR	Yes before, unclear after	n/a	1/891 surgical admissions (0.1%)

				2.MD rates 0-6 scale for causality, $\geq 4 = AE$		2. Caused by health care	into 6 categories				
Rahim, 2009	Single hospital, Canada	Retro-spective	Consecutive CCU admissions	Single reviewer determined Y/N AE	n/a	1. Injury 2. Caused by health care	Type of AE classified by reviewer into 6 categories	Incorrect or delayed diagnosis, failure to use indicated test or test results, inadequate patient assessment	Unclear	n/a	9/194 CCU admissions (4.6%)
Gea-Velazquez, 2010	Single hospital, Spain	Pro-spective	Convenience sample of all admissions	1. Two stage review 2. MD rates on 1-6 scale for causality, $\geq 4 = AE$	NR	1. Injury 2. Caused by health care 3. Disability, prolonged LOS	Type of AE classified by reviewer into 6 categories	Delay in diagnosis	No	NR	1/2386 (.04%)
Zwaan, 2010	21 hospitals, Netherlands	Retro-spective	$\frac{1}{2}$ random sample of admits, other $\frac{1}{2}$ deceased patients	1. Two stage review 2. MD rates 1-6 scale for causality, $\geq 4 = AE$	18 criteria based no HMPS	1. Injury 2. Caused by health care 3. Resulted in temporary or permanent disability, death or LOS	Type of AE classified by reviewer into 7 categories	Diagnostic errors that lead to patient harm	Yes, before and after	Kappa 0.25 for AE	80/7926 (1.0%)
Bapoje, 2011	Single hospital, United States	Retro-spective	Consecutive unplanned internal medicine inpatient transfers to ICU	n/a	n/a	NR	Three MD independently rate transfer as due to error and/or preventable	Conditions that were overlooked at admission but explained the chief complaint	No	Kappa 0.55-0.90	1/152 unplanned transfers to ICU (0.7%)
Forster, 2011	Single hospital, Canada	Pro-spective cohort	Convenience sample, ICU, internal medicine, obstetric,	1. Embedded observer records trigger events	102 criteria developed by authors	1. Adverse outcome 2. Caused by health care	Type of AE classified by reviewer into 9 categories	Incorrect or delayed diagnosis	Unclear	n/a	10/1406 (0.7%)

			cardiac surgery	2.Group reviews positive screens 3.Group rates on 1-6 scale for causality, $\geq 4=AE$							
Baines, 2013	20 hospitals, Netherlands	Retro-spective	½ random sample of admits, ½ deceased patients	1.Two stage review 2.MD rates on 1-6 scale for causality, $\geq 4=AE$	18 criteria based on HMPS	1.Injury 2.Caused by health care 3. Resulted in temporary or permanent disability, death or LOS	Type of AE classified by reviewer into 7 categories	Missed, delayed or inappropriate diagnosis	Yes, before and after	Kappa 0.47 for AE	60/3996 admits/deaths (1.5%)
Zwaan, 2013	5 hospitals, Netherlands	Retro-spective	Convenience sample of patients admitted with dyspnea	n/a	n/a	n/a	MD reviewer determined Y/N diagnostic error and Y/N harm	Delayed, wrong or missed diagnoses	No	Kappa 0.51 for diagnostic error	6/247 dyspneic admits (2.4%)
Van Rosse, 2014	4 hospitals, Netherlands	Pro-spective	Convenience sample of hospital admissions oversampled for ethnic minorities	1.Two stage review 2.MD rates on 1-6 scale for causality, $\geq 4=AE$	16 criteria based on HMPS	1.Injury 2.Caused by health care 3. Resulted in temporary or permanent disability, death or LOS	Type of AE classified by reviewer into 5 categories	NR	Unclear	Positive agreement for AE 61%, negative agreement 84%	7/1339 (0.5%)
Amaral, 2015	Single hospital, United Kingdom	Pro-spective	Consecutive rapid response team (RRT) calls	Three independent MD reviewers rated 1-6 for causality, took the average, $\geq 4=AE$	n/a	1.Injury 2.Caused by health care 3.Leaded to increased morbidity defined as requiring new treatment, prolonged LOS, disability at discharge.	Group consensus on type of AE into 3 categories	NR	Unclear	Kappa 0.46 for AE	14/247 RRTs (5.7%)

Baines, 2015	20 hospitals, Netherlands	Retro-spective	½ random sample of admits, ½ deceased patients	1.Two stage review 2.MD rates on 1-6 scale for causality, ≥4=AE	Based on HMPS	1.Injury 2.Caused by health care 3. Resulted in temporary or permanent disability, death or LOS	Type of AE classified by reviewer into 7 categories	NR	Yes, before and after	Positive agreement 56.9%, negative agreement 82.9%	33/4048 admits/deaths (0.8%)
Marquet, 2015	6 hospitals, Belgium	Retro-spective	All unplanned transfers to ICU or emergency response calls	Multi-disciplinary group rates on 1-6 scale for causality, ≥4=AE	n/a	1.Injury 2.Caused by health care 2.Disability at discharge, death, or LOS	Type of AE classified by group into 10 categories	Delayed or wrong diagnosis	Unclear	n/a	58/830 ICU transfers (7.0%)§
Al-Jaghbeer, 2016	8 hospitals, United States	Retro-spective	Random selection of ICU readmissions	Two independent MD reviewers rated 1-6 for causality, ≥4=AE	n/a	Readmissions that were caused by health care and preventable	Type of AE classified by reviewer into 6 categories	Critical illness due to provider not following appropriate diagnostic algorithm	No	Kappa 0.26 for causality, 0.23 for preventability	1/136 ICU readmits (0.7%)
Bellandi, 2017	Single hospital, Italy	Retro-spective	Random selection of cardiac surgery patients	1.Two stage review 2.MD reviewer determined Y/N AE	14 criteria based on HMPS adapted for cohort	1.Injury 2.Caused by health care 3. Resulted in disability, death or prolonged LOS	Type of AE classified by reviewer into 4 categories	NR	No	Agreement 100% for Y/N AE	4/280 cardiac surgery patients (1.4%)
Bellido, 2017	Single hospital, Spain	Pro-spective	Selection of admissions to internal medicine	1.Two stage review 2.MD group determined Y/N AE	NR	1.Damage with negative consequences for the patient 2. Caused by health care	Type of AE classified by reviewer into 5 categories	Delayed or incorrect diagnosis	Unclear	NR	4/667 internal medicine patients (0.6%)
Letaief, 2017	3 hospitals, Tunisia	Pro-spective	Consecutive surgical admissions	1.Two stage review 2.MD reviewer determined Y/N AE	18 criteria based on HMPS	1.Injury 2.Caused by health care	Type of AE classified by reviewer into 6 categories	NR	No	n/a	32/1687 general surgery patients (1.9%)
Zhang, 2017	Single hospital, Taiwan	Pro-spective	Patients who were admitted to floor and	Two independent MD reviewers	n/a	1.Injury or potential harm	Type of AE classified by reviewer	NR	Unclear	Kappa 0.86 for AE	8/100 deaths or transfers

either died or transfer to ICU in 1st 24 hours	rated 1-6 for causality, ≥4=AE	2.Caused by health care	into 5 categories	within 24 hours (8.0%)
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Abbreviations: AE, adverse event; MD, Doctor of Medicine; HMPS, Harvard Medical Practice Study; Y/N, yes or no; NR, not reported; n/a, not applicable; ER, emergency room; LOS, length of stay; CCU, cardiac care unit; ICU, intensive care unit.

*Authors only report total rate of diagnostic error, not harmful diagnostic errors.

†Forster primarily studied adverse events that occurred after discharge but also included adverse events that occurred during the admission but weren't recognized during the actual admission.

#Patient screening was done prospectively, then the full chart was retrospectively reviewed after discharge.

§Preventable diagnostic adverse events.