Multimedia Appendix 1. Studies of health information exchange included for assessing outcomes.

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
Laboratory testing or cost of testing									
	Mäenpää et al 2011 [23]	Tampere, Finland	OP[a]	Q[b]	RC[c]	L[d]	Negative	Laboratory testing	Increased testing during period of health information exchange (HIE) implementation (19.0% for primary care physicians and 7.0% for specialist physicians per total patient appointments).
	Ross et al 2013 [24]	Mesa County, Colorado	OP[a]	Q[b]	RC[c]	L[d]	Beneficial	Rate of increase in laboratory testing	After HIE implementation, reduction in rising rate of testing, without overall cost savings
	Carr et al 2014 [54]	Charleston, South Carolina	Emergency department (ED)	Q[b]	CS[e]	M[f]	Beneficial	Laboratory testing	US $462 in savings over 3 months through averted laboratory testing in EDs
	Frisse et al 2012 [25]	Memphis, Tennessee	ED	Q[b]	RC[c]	M[f]	Beneficial	Laboratory testing	Odds ratio (OR) of testing among patients for whom HIE accessed was 0.880 (95% CI 0.828-0.935)

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Tzeel et al 2011 [26]	Milwaukee, Wisconsin	ED	Q[b]	RC[c]	L[d]	Beneficial	ED visit costs	23% fewer laboratory testing procedures (statistical significance not reported) in propensity-matched group of patients for whom HIE was used
	Winden et al 2014 [55]	Minnesota	ED	Q[b]	CS[e]	M[f]	Beneficial	Laboratory testing	96 instances of duplicate laboratory testing averted in 1488 patient encounters
Radiology testing									
	Bailey et al 2013 [27]	Memphis, Tennessee	ED	Q[b]	RC[c]	L[d]	Beneficial	Use of neuroimaging	HIE usage associated with decreased diagnostic imaging (OR 0.38; 95% CI 0.29-0.50) and increased adherence to evidence-based guidelines (OR 1.33; 95% CI 1.02-1.73), although no significant change in overall costs

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Bailey et al 2013 [28]	Memphis, Tennessee	ED	Q[b]	RC[c]	L[d]	Beneficial	Use of back imaging	HIE usage associated with reduced repeat imaging for back pain (OR 0.36; 95% CI 0.18-0.71), but no change in cost due to higher use of CT[g] scans with HIE access
	Carr et al 2014 [54]	Charleston, South Carolina	ED	Q[b]	CS[e]	M[f]	Beneficial	Use of radiology testing	US $161,000 in savings over 3 months through averted radiologic testing in EDs
	Frisse et al 2012 [25]	Memphis, Tennessee	ED	Q[b]	RC[c]	M[f]	Beneficial	Use of radiology testing	Reduction of head CT[g] imaging (OR 0.913; 95% CI 0.842-0.991) and body CT[g] imaging (OR 0.886; 95% CI 0.828-0.948) but no significant changes in echocardiogram, chest X-ray, or ankle X-ray testing across 12 EDs

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Lammers et al 2014 [52]	California and Florida	ED	Varied	XS[h]	L[d]	Beneficial	Reimaging in ED	Reduced probability of repeat CT[g] (-8.7%; 95% CI -14.7% to -2.7%), ultrasound (-9.1%; 95% CI -17.2% to -1.1%), and chest X-ray (-13.0%; 95% CI -18.3% to -7.7%) ordering in hospitals that had HIE participation
	Mäenpää et al 2011 [23]	Tampere, Finland	OP[a]	Q[b]	RC[c]	L[d]	Beneficial	Use of radiology testing	Reduction in radiologic testing: 16.4% reduction for primary care physicians and 11.0% reduction for specialist physicians
	Ross et al 2013 [24]	Mesa County, Colorado	OP[a]	Q[b]	RC[c]	L[d]	None	Use of radiology testing	No statistically significant reduction in the rate of radiologic testing
	Tzeel et al 2011 [26]	Milwaukee, Wisconsin	ED	Q[b]	RC[c]	L[d]	Beneficial	ED visit costs	22% decreased diagnostic radiology ordering and 52% reduced CT[g] scan ordering (statistical significance not reported) when HIE was used in ED

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Winden et al 2014 [55]	Minnesota	ED	Q[b]	CS[e]	M[f]	Beneficial	Use of radiology testing	453 instances of duplicate radiology testing averted in 1488 patient encounters
Hospital admissions									
	Ben-Assuli et al 2013 [29]	Israel	HMO[i]	Q[b]	RC[c]	L[d]	Beneficial	Hospital admissions	Viewing medical history via electronic health record (EHR) decreased possibly redundant admissions, with even greater reductions of 48% at 7 days when information was accessed using HIE
	Ben-Assuli et al 2013 [56]	Israel	HMO[i]	Q[b]	RC[c]	L[d]	Beneficial	Hospital admissions	Viewing medical history via EHR decreased possibly redundant admissions, with even greater reductions of 6.0% at 7 days when information was accessed using HIE
	Frisse et al 2012 [25]	Memphis, Tennessee	ED	Q[b]	RC[c]	L[d]	Beneficial	Hospital admissions	US $1.07 million annual savings, with 97.6% due to reduced admissions

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Carr et al 2014 [54]	Charleston South Carolina	ED	Q[b]	CS[e]	M[f]	Beneficial	Hospital admissions	US $118,000 in savings from averted admissions over a 3-month period
	Tzeel et al 2012 [30]	Milwaukee, Wisconsin	ED	Q[b]	RC[c]	L[d]	Mixed	Hospital admissions Length of stay	28% increased rate of admissions, although such admissions had reduced length of stay with 771 fewer bed days per 1000 health plan members over 16 months
	Vest 2009 [31]	Austin, Texas	ED	Q[b]	RC[c]	L[d]	Beneficial	Hospital admissions for ambulatory-sensitive diagnoses in indigent patients	Increased admissions for ambulatory-sensitive diagnoses
	Vest et al 2014 [32]	Rochester, New York	ED	Q[b]	RC[c]	L[d]	Beneficial	Hospital admissions	Viewing information reduced odds of admission (OR 0.70; 95% CI 0.52-0.95).
Hospital/ED readmissions									

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Lang et al 2006 [49]	Montreal, Canada	ED	D[j]	Randomized controlled trial (RCT)	M[f]	None	ED return visits	Providing family physicians electronic reports of ED visits versus paper-based reports resulted in no difference in hospital admissions or ED return visits
	Vest et al 2014 [33]	Rochester, New York	ED	Q[b]	RC[c]	L[d]	Beneficial	Hospital readmissions	Accessing information associated with reduced odds of hospital readmission (OR 0.43; 95% CI 0.27-0.70)
	Jones et al 2011 [53]	United States	All	Varied	XS[h]	L[d]	None	Hospital readmissions	US hospitals participating in HIE in 2007 did not have lower readmission rates for acute myocardial infarction, pneumonia, or heart failure
Referrals and/or consultations									

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Carr et al 2014 [54]	Charleston, South Carolina	ED	Q[b]	CS[e]	M[f]	Beneficial	Consultation	US $4000 in savings over 3 months through averted consultations in EDs
	Mäenpää et al 2011 [23]	Tampere, Finland	OP[a]	Q[b]	RC[c]	L[d]	Mixed	Referral ordering	Increased referrals by primary care physicians (43.6%) and specialists (12.8%)
ED costs									
	Frisse et al 2012 [25]	Memphis, Tennessee	ED	Q[b]	RC[c]	L[d]	Beneficial	Overall cost	US $1.07 million annual savings, with 97.6% due to reduced admissions
	Tzeel et al 2011 [26]	Milwaukee, Wisconsin	ED	Q[b]	RC[c]	L[d]	Beneficial	ED visit costs	US $29 per ED visit less expenditures, driven by reduced laboratory testing
Public health reporting									
	Magnus et al 2012 [34]	Louisiana	PH[k]	D[j]	RC[c]	L[d]	Beneficial	Follow-up care for HIV patients	Increased identification of needed follow-up care of 419 HIV patients, with 85% having actual follow-up care

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Dixon et al 2011 [35]	Indiana	PH[k]	D[j]	RC[c]	L[d]	None	Completeness of public health reporting	Equal or improved completeness of reporting for a variety of data fields in notifiable disease reports, although completeness was reduced for some fields (eg, laboratory units of measure, normal range, and abnormal flag) due to inadequacies in the clinical data entering the HIE
	Overhage et al 2008 [36]	Indiana	PH[k]	D[j]	RC[c]	L[d]	Beneficial	Identification and completeness of notifiable disease reporting	Automated laboratory reporting through HIE led to 4.4-fold higher rate of reporting, with cases identified an average of 7.9 days earlier compared with usual (spontaneous) public health reporting
Quality of ambulatory care									

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Kern et al 2012 [37]	Hudson Valley, New York	OP[a]	Q[b]	RC[c]	L[d]	Beneficial	Clinical quality measures	For a benchmark group of clinical quality measures believed to be amenable to HIE, users of HIE had a higher proportion exceeding mean clinical quality measure performance at baseline (57% vs 48%) that increased further after HIE became available (64% vs 49%), with increase before and after availability of HIE statistically significant (*P*<.001)

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Nagykaldi et al 2014 [38]	Norman and Oklahoma City, Oklahoma	OP[a]	Q[b]	RC[c]	M[f]	Beneficial	Clinical quality measures	Improved documentation and delivery of preventive services for mammography screening (21.1-57.1%, *P*<.01), colonoscopy screening (31.7-53.8%, *P*<.01), pneumococcal vaccine administration (39.1-50.6%, *P*<.01), and influenza vaccine administration (22.7-41.7%, *P*<.01). Also found that medication reconciliation completion improved from 35.3% to 44.9% (*P*<.001).

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Willis et al 2013 [50]	North Carolina	OP[a]	Q[b]	RCT	M[f]	Beneficial	Documentation and medication reconciliation	HIE data used in a clinical decision support intervention able to detect medication adherence problems in 8 categories of drugs but did not show any benefit in improving adherence by patients in taking medications prescribed based on evidence-based guidelines
Other aspects of HIE									
	Feldman and Horan 2011 [39]	Virginia	G[l]	D[j]	RC[c]	M[f]	Beneficial	Case processing time for SSD[m] determination	30% reduction in evaluation time for Social Security Disability claims
	Shapiro et al 2013 [40]	New York	ED	Q[b]	RC[c]	M[f]	Beneficial	Identification of frequent ED users	20.3% increase in identifying frequent ED users compared with site-specific data

	Study	Location	Setting	Health information exchange type	Study type	Risk of bias	Direction of result(s)	Outcome(s) assessed	Results of health information exchange
	Vest and Miller 2011 [41]	US	H[n]	Varied	XS[h]	L[d]	Beneficial	Patient satisfaction with hospital care	Communication and satisfaction (based on the Hospital Consumer Assessment of Healthcare Providers and Systems survey) higher in hospitals that implemented HIE compared with those that proposed to implement HIE

[a]OP: outpatient

[b]Q: query

[c]RC: retrospective cohort

[d]L: low

[e]CS: case series

[f]M: moderate

[g]CT: computing tomography

[h]XS: cross sectional

[i]HMO: health maintenance organization

[j]D: directed

[k]PH: public health

[l]G: government

[m]SSD: Social Security Disability

[n]H: hospital