

Supplementary Material

Supplementary Table 1: Studies that addressed accuracy of indication documentation compared to gold standard

Author, Year	Location of indication documentation	Presence of CPOE	Accuracy gold standard	Presence of standards for indication documentation	Prevalence of accurate prescriptions
Beardsley J, 2020	With prescription (e.g., orders)	Yes	Chart review	Yes	161/180 (89%)
Conard N, 2021	With prescription (e.g., orders)	Yes	Chart review or diagnostic code	Yes	3463/4178 (83%)
Heil E.L, 2018	With prescription (e.g., orders)	Yes	Chart review	Yes	356/396 (90%)
Khadem T., 2018	With prescription (e.g., orders)	Yes	Chart review	Yes	30/122 (25%)
Lee T, 2017	With prescription (e.g., orders)	Yes	Chart review	No	39/50 (78%)
Livengood S.J., 2020	With prescription (e.g., orders)	Yes	Diagnostic Code	No	43279/135516 (32%)
Mary B, 2019	With prescription (e.g., orders)	Yes	Chart review	Yes	237/304 (78%)
McCoy D, 2017	With prescription (e.g., orders)	Yes	Chart review	No	67/86 (78%)
McKittrick M, 2017	Elsewhere in health record (e.g., patient chart)	Not specified	Chart review	No	33/33 (100%)
Ratliff A, 2020	With prescription (e.g., orders)	Yes	Chart review	Yes	80/99 (81%)
Scardina T, 2020	With prescription (e.g., orders)	Yes	Chart review	Yes	129/284 (45%)
Sola-Bonada N., 2013	With prescription (e.g., orders)	Yes	Unclear	No	182/250 (73%)
Timmons V., 2018	With prescription (e.g., orders)	Yes	Chart review	Yes	121/154 (79%)
Wang N., 2018	With prescription (e.g., orders)	Yes	Chart review	Yes	728/899 (81%)

CPOE: computerized provider order entry

Supplementary Table 2: Studies that assessed interventions on indication documentation

Author, Year	Intervention	EPOC taxonomy	Outcome*	Outcome direction*
Allan PA, 2016	Educational campaign, audit and feedback to prescribers	Combination	Prevalence of indication documentation (Rx)	Improved +39%
Arnold M, 2020	Posters, verbal and electronic communication were used to educate staff of the prescribing requirements.	Educational materials	Prevalence of indication documentation (Rx)	Improved +12%
Ashiru-Oredope D, 2011	New hospital chart	Other	Prevalence of indication documentation (Rx)	Improved +26%
Baysari M, 2017	Drop down indications	Health information systems	Indication accuracy (Rx)	Decreased -20%
Bowers T, 2020	E-prescribing	Health information systems	Prevalence of indication documentation (Rx)	Improved +18%
Charani E, 2017	Mobile app for prescribing policy	Other	Prevalence of indication documentation (Rx)	Declined -16%
Chatzapolou D, 2020	Education and quality improvement: posters, awareness campaign	Educational materials	Prevalence of indication documentation (ns)	Improved +53%
Chaves N, 2014	Audit and feedback to ICU staff at group meetings, Yellow medication record reminder sticker on medication record	Combination	Prevalence of indication documentation (Rx)	Improved +25%
Chilton N, 2010	Audit and feedback	Audit and feedback	Prevalence of indication documentation (Rx)	Improved +24%
Coll A, 2012	Audit and feedback	Audit and feedback	Prevalence of indication documentation (Rx)	Improved +35%
Cooley N, 2012	Automatic stop dates, electronic prescribing systems, medication charts with specific areas for antibiotic prescriptions and education and training	Combination	Prevalence of indication documentation (ns)	Improved +20%
Cunney R, 2019	Front line ownership/meetings update guidelines, audit and feedback, PDSA cycles	Combination	Prevalence of indication documentation	Improved +70%

			(chart)	
Davis G, 2019	Behaviour modification via teaching, prescription policy, drug chart changes	Combination	Prevalence of indication documentation (ns)	Not specified
De Terline D, 2014	Informed clinical units in writing of the results of a survey on prescribing quality and the objective to improve prescribing .	Audit and feedback	Prevalence of indication documentation (Rx)	Declined -11%
Doukas F, 2020	Audit and feedback	Audit and feedback	Prevalence of indication documentation (ns)	Improved +23%
Howard P, 2011	Mandatory indication in patient's notes, then mandatory indication on prescription, education through briefings and screen savers, audit and feedback	Combination	Prevalence of indication documentation (Rx)	Improved +27%
Infectious Diseases Institute – Makerere University, Uganda, 2020	Audit and feedback, guidelines, education, commitment letters	Combination	Prevalence of indication documentation (Rx)	Improved +25%
Johnston D.N., 2019	Education- teaching session following first audit, group level audit/feedback	Audit and feedback	Prevalence of indication documentation (Rx)	Improved +37%
Jones T, 2019	Self-review tool (yellow sticker reminder)	Reminder	Prevalence of indication documentation (Rx)	Improved +17%
Kirrane M, 2016	Front line ownership/meetings, update to guidelines, reminders, audit and feedback, PDSA cycles	Combination	Prevalence of indication documentation (ns)	Improved +70%
Lamba V, 2020	PDSA- team meetings, interviews, order set standardization	Continuous quality	Prevalence of indication documentation (Rx)	Improved p=0.049
Lee A, 2021	Educational session, microbiology rounds on surgical inpatients, intro of e-prescribing w/ prompt	Combination	Prevalence of indication documentation (Rx)	Improved +18%
Metcalfe J, 2017	Mandatory free text indication for restricted antimicrobials	Health information systems	Prevalence of indication documentation (Rx)	Improved +43%
Moore A, 2020	When a pharmacist identifies a prescription error, the prescriber is sent feedback about this error	Audit and feedback	Prevalence of indication documentation (Rx)	Improved, not specified
Neels A J, 2020	Teaching session	Educational meetings	Prevalence of indication documentation (ns)	Improved, not specified

Oshun P, 2021	Education and feedback with antibiotic policy	Educational meetings	Prevalence of indication documentation (chart)	Improved +44%
Roberts E, 2015	Prospective audit and feedback	Audit and feedback	Prevalence of indication documentation (chart)	Improved +6%
Rojoa D, 2019	Microbiology proforma	Other	Prevalence of indication documentation (Rx)	Improved +54%
Seaton R, 1999	Survey on clinical record keeping and feedback at team meeting	Audit and feedback	Prevalence of indication documentation (chart)	Improved +11%
Surat G, 2021	Implementation of local ASP: PAF, metrics, restrictions, antibiograms, electronic guideline access (none targeted at indication)	Combination	Prevalence of indication documentation (chart)	Declined -0.5%
Triantafillou M, 2011	Guidelines and antibiotic restrictions	Clinical practice guidelines	Prevalence of indication documentation (Rx)	Improved p=0.71
West Hertfordshire Hospitals NHS Trust, NHS, UK, 2020	New drug chart with indication documentation	Other	Prevalence of indication documentation (Rx)	Improved +84%
Yeo J.M., 2016	Pocket card, checklist, posters, team meetings and certificates for involvement in QI process	Combination	Prevalence of indication documentation (chart)	Improved +72%

*all changes absolute unless otherwise specified*Rx: documentation with prescription, chart: documentation on chart/elsewhere on health record, ns: not specified

Supplementary Table 3. Studies that evaluated association between indication documentation and prescribing and patient outcomes

Study	Setting	Intervention	Main Outcome	Outcome Direction*
Chan AJ, 2018 (observational)	Hospital	Mandatory indication for selected antimicrobials (Rx)	Antibiotic DOTs	Improved -18 days of therapy/1000 patient days
Gong C, 2019 (observational)	Community	Accountable justification for antibiotics for acute respiratory infections (Rx)	Quality adjusted life years Costs to clinic	Improved +0.06 QALY -\$5.39
Goss F.R., 2020 (observational)	Hospital	Indication-based prescribing (Rx)	Antibiotic appropriateness (Guideline concordance - antibiotic selection)	Improved +5%
Gunn L, 2018 (observational)	Hospital	Mandatory indication for fluoroquinolones (Rx)	Fluoroquinolone prescribing rate	Improved -8%
Hansen B, 2021 (observational)	Hospital	Pharmacist driven contact with prescriber. Alert firing based on provider-selected indication where orders did not meet restriction criteria (ns)	Rate of adherence to antibiotic restriction	Improved +6%
Haynes K, 2011 (observational)	Hospital	Order set (Rx)	Timely discontinuation of antibiotic therapy	Improved +17%
Jones T, 2019 (observational)	Hospital	Reminder sticker (Rx)	Antimicrobial appropriateness (Guideline concordance)	Improved +16%
Liang H. Y., 2015 (observational)	Hospital	Mandatory indication (Rx)	Antibiotic appropriateness (Not specified)	Improved Not specified
Linder J, 2017 (randomized)	Community	Accountable justification for acute respiratory tract infections (12 months after intervention stopped; see Meeker 2016) (Rx)	Antibiotic appropriateness (Antibiotic non-prescribing for indications not requiring antibiotics)	Increase in inappropriate prescribing after stopping intervention, +4.1%
Marshall MB, 2017 (observational)	Hospital	Mandatory indication (Rx)	Antimicrobial defined daily doses	Improved -189 DDD/1000 patient days
Meeker D., 2016 (randomized)	Community	Accountable justification for acute respiratory tract infections (Rx)	Antibiotic appropriateness (Antibiotic non-prescribing for indications not requiring antibiotics)	Improved +18%
Nash CB, 2015 (observational)	Hospital	Switch from restriction with pre-authorization to indication-based prescribing (Rx)	Antibiotic days of therapy	No change Not specified

Nomura Y, 2018 (observational)	Hospital	Mandatory provider-selected indication (Rx)	Antibiotic appropriateness (Guideline concordance - antibiotic selection and dosing)	Improved +0.5%
Persell S, 2014 (randomized)	Community	Education and prompt for accountable justification (Rx)	Antibiotic appropriateness (Antibiotic non-prescribing for indications not requiring antibiotics)	Improved +20%
Reyes C., 2016 (observational)	Hospital	Multimodal intervention including Mandatory indication and electronic health record alert (Rx)	Meropenem appropriateness (based on selection and dosage) and utilization	Improved +33% Selection Meropenem days/1000 patient days and length of therapy per admission -60%
Stocker M, 2012 (observational)	Hospital	Mandatory checklist requiring indication and antibiotic timeout (checklist)	Antibiotic appropriateness (empiric selection, duration of therapy, targeted selection)	Improved +56% empiric selection Duration of therapy <3d +17%
Thakkar K., 2011 (observational)	Hospital	Multimodal intervention regarding policy for indication documentation (Rx and Chart)	Antibiotic appropriateness (Guideline concordance - selection based on policy or infectious diseases recommendation)	Improved +41%
Wagner JL, 2020 (observational)	Hospital	Indication documentation (ns)	Clinical success	Improved +6%
Wirtz A., 2020 (observational)	Hospital	Mandatory indication and antibiotic timeout (Rx)	Days of therapy	Improved -14 DOT/1000 patient days

*all changes absolute unless otherwise specified

*Rx: documentation with prescription, chart: documentation on chart/elsewhere on health record, checklist: documented indication on checklist ns: not specified

Supplementary Figure 1. Visual Abstract of Key Messages and Next Steps for Indication Documentation

