Do pneumonia readmissions flagged as potentially preventable by the 3M PPR software have more process of care problems? A cross-sectional observational study

Ann M Borzechki,1,2,3 Qi Chen,4 Joseph Restuccia,4,5 Hillary J Mull,4,6 Michael Shwartz,4,5 Kalpana Gupta,3,7 Amresh Hanchate,3,4 Judith Strymish,7,8 Amy Rosen4,6

ABSTRACT

Background In the USA, administrative data-based readmission rates such as the Centers for Medicare and Medicaid Services’ all-cause readmission measures are used for public reporting and hospital payment penalties. To improve this measure and identify better quality improvement targets, 3M developed the Potentially Preventable Readmissions (PPRs) measure. It matches clinically related index admission and readmission diagnoses that may indicate readmissions resulting from admission- or post-discharge-related quality problems.

Objective To examine whether PPR software-flagged pneumonia readmissions are associated with poorer quality of care.

Methods Using a retrospective observational study design and Veterans Health Administration (VA) data, we identified pneumonia discharges associated with 30-day readmissions, and then flagged cases as PPR-yes or PPR-no using the PPR software. To assess quality of care, we abstracted electronic medical records of 100 random readmissions using a tool containing explicit care processes organised into admission work-up, in-hospital evaluation/treatment, discharge readiness and post-discharge period. We derived quality scores, scaled to a maximum of 25 per section (maximum total score=100) and compared cases by total and section-specific mean scores using t tests and effect size (ES) to characterise the clinical significance of findings.

Results Our abstraction sample was selected from 11 278 pneumonia readmissions (readmission rate=16.5%) during 1 October 2005–30 September 2010; 77% were flagged as PPR-yes. Contrary to expectations, total and section mean quality scores were slightly higher, although non-significantly, among PPR-yes (N=77) versus PPR-no (N=23) cases (respectively total scores 71.2±8.7 vs 65.8±11.5, p=0.14), differences demonstrated ES >0.30 overall and for admission work-up and post-discharge period sections.

Conclusions Among VA pneumonia readmissions, PPR categorisation did not produce the expected quality of care findings. Either PPR-yes cases are not more preventable, or preventability assessment requires other data collection methods to capture poorly documented processes (eg, direct observation).

INTRODUCTION

In the USA, readmission rates are increasingly being adopted as hospital performance measures for public reporting and payment in an effort to improve care and decrease costs. The Centers for Medicare and Medicaid Services (CMS) posts 30-day all-cause readmission rates after discharge for three selected medical conditions (acute myocardial infarction, heart failure (HF), pneumonia) on its Hospital Compare website and penalises hospitals with excessive readmission rates under the Medicare Hospital Readmission Reduction Program.1,2 CMS selected these conditions because they are common reasons for hospitalisations and readmissions, result in substantial healthcare costs, and have associated evidence-based processes of care that may reduce 30-day readmissions.3–6 Despite general agreement that at least some readmissions are preventable through improved quality of care, the actual proportion is uncertain (5–79%),7 as is the extent to which they result from
patient- and community-level factors that are outside a hospital’s control.

Recognising the need to identify readmissions that are more likely to be preventable and therefore better quality improvement targets, 3M Health Information Systems developed the commercially available Potentially Preventable Readmissions (PPRs) software. Like the CMS measures, the PPRs use administrative data. A PPR is defined as a readmission that is clinically related to care received during or following the prior hospitalisation within a specified time interval and that might have been prevented by appropriate care. Specifically, a readmission is considered potentially preventable if it might have been prevented through “provision of quality care in the initial hospitalisation; adequate discharge planning; adequate post-discharge follow-up; [or] coordination between inpatient and outpatient healthcare teams.” This definition was put into operation by clinician panels determining ‘clinical relatedness’ through pairing ‘all patient refined-diagnosis related groups’ from the index admission and subsequent readmission. Non-PPR readmissions are considered less likely to be preventable for reasons such as being not clinically related, or clinically related but with low preventability (eg, a patient with a bone marrow transplant readmitted with shingles after a pneumonia admission).

Although the degree to which such paired admissions—readmissions reflect process of care deficiencies and are therefore potentially preventable is unclear, State Medicaid programmes are increasingly adopting the PPRs for public reporting and hospital payment. A recent Medicare Payment Advisory Commission analysis lent some face validity to the PPRs, as condition-specific PPR rates dropped slightly more than CMS all-cause readmissions from 2009 to 2011. While both CMS readmission measures and PPRs are intended for hospital-level comparisons, hospitals concerned about their rates and targeting quality improvement activities require information on preventability at the individual case level. Therefore, using the cohort of pneumonia discharges and associated all-cause readmissions identified by CMS methods, we examined whether the PPR algorithm identifies readmissions that are more likely to be preventable based on electronic medical record (EMR) review. Because software-flagged PPR cases are considered more preventable than unflagged cases, we hypothesised that they would demonstrate more processes of care failures. The Veterans Health Administration’s (VAs) comprehensive highly integrated national EMR system, containing both inpatient and outpatient information, enables us to assess an extensive range of processes and include the post-discharge/outpatient setting.

METHODS

Study design

This was a cross-sectional retrospective observational study using VA administrative and EMR data from 1 October 2005 to 30 September 2010. We obtained relevant institutional review board approvals.

Data sources

We obtained inpatient information (demographics, ICD-9-CM coded diagnoses and procedures and discharge status) and outpatient encounter diagnoses from the VAs National Patient Care Database and dates of death from VA vital status files. We accessed VA EMR data using VistaWeb. We also used CMS MedPar files for selected sensitivity analyses.

Study sample

Since we were interested in how the PPR measure potentially improves upon the CMS all-cause pneumonia readmission measure, we used CMS methods, as described in previous work, to identify all VA acute index discharges with a principal diagnosis of pneumonia during FY07 through FY10 associated with a VA readmission within 30 days. Although the PPR measure also excludes certain admissions as ineligible because they require “follow-up care that is intrinsically clinically complex and ...preventability is difficult to assess” (eg, admissions for ‘major or metastatic malignancy’), we retained these PPR-ineligible cases to be consistent with CMS methods, which include these cases. For similar reasons and to simplify EMR abstraction, we used CMS methods to identify index admissions associated with a single readmission, defined as the first VA acute-care hospitalisation occurring within the 30-day post-index discharge period. Of 68 138 index discharges, 11 278 (16.5%) were readmitted.

We next applied the 3M PPR software (V.28.0) to flag readmissions as a PPR (yes/no; the software also identifies ineligible cases, which we included with the PPR–no cases). We randomly selected 600 index discharge–readmission pairs for potential EMR abstraction. Our goal was to fully review 100 pairs. (We expected to exclude cases intended as CMS exclusions that were not captured by the administrative data and that might make attributing a readmission to the care associated with the index hospitalisation and/or post-discharge period harder, such as having a transfer out to a non-VA hospital. We also excluded planned readmissions, consistent with both PPR and CMS methods). Assuming a SD of 10 for the 0–100 quality score (described below) and a 0.05 significance level, a sample size of 100 gave us approximately 90% power to detect a half SD difference in quality scores between PPR–yes and PPR–no cases. This represents a medium effect size (ES) and, is a threshold widely used to discriminate change. (See figure 1 for further study sample details).

Development of explicit process criteria representing pneumonia standard of care

Figure 2 shows the steps involved in developing pneumonia process of care criteria. We first identified...
candidate criteria representing the standard of pneumonia care through an extensive literature review, including studies on pneumonia readmissions, pneumonia quality of care, and generic studies on readmission preventability (see online supplementary appendix 1), plus national pneumonia clinical practice guidelines and process measures. Clinical co-investigators helped to modify the list, yielding 97 criteria. According to previous studies, we grouped criteria into four sections: (A) admission work-up; (B) in-hospital evaluation and treatment; (C) discharge readiness (clinical stability at discharge) and planning; and (D) post-discharge period.

We then refined criteria using a consensus panel model based on the RAND/UCLA appropriateness method. We assembled an expert panel of four internists, three pulmonologists, and three infectious disease specialists. Using an online survey, panellists rated individual items on the extent to which they believed they represented the standard of pneumonia care using a seven-point scale (1=strongly disagree, 7=strongly agree). Panellists could also propose additional items or wording changes to existing items.

In line with standard RAND/UCLA appropriateness methods, we conducted two rating rounds, collating results after each round. We assessed disagreement/uncertainty based on median panellist score: <6.0 represented lack of agreement with the item, eligible for modification/re-rating; median ≥6.0 and no rating <5 represented strong agreement with the item. We kept items meeting this latter criterion without further discussion or rating. After round 1, we discussed items with disagreement/uncertainty via teleconference. Panellists then re-rated items for which there was a previous lack of agreement (n=48) and rated any added or modified items (n=5). After this process, we kept 92 items, those with strong agreement plus those with a median score ≥6.0 and only one rating <5.

Abstraction tool development/medical record abstraction
We incorporated clinical items into an abstraction tool if they could be converted to ‘if/then’ statements to assess quality of care (see online supplementary Appendix 2a for if/then statement examples). The tool also included case ascertainment items (ie, the
case had to fit a clinical definition of pneumonia that included a new chest X-ray infiltrate, and selected items contained in the Pneumonia Severity Index score.

Two trained nurse-abstractors reviewed the EMRs. After piloting the tool on five records, we dropped items that were present in all cases (eg, having a white blood cell count performed on admission), present in very few cases (eg, functional status documentation), difficult to use as a quality criterion (eg, the discharge summary documented recommendations for medication changes—this would require assessing whether any medication changes or lack thereof were appropriate), or time consuming to abstract/of low reliability (eg, “If a medication for a comorbidity was changed within 24 h of discharge, then post-discharge follow-up was arranged within 7 days.”) We frequently found discrepancies in documentation of admission medications or in-hospital changes depending on the source reviewed making this time consuming to assess and of low inter-rater reliability. We also dropped several items pertaining to admission history documentation (unless they were relevant to appropriate antibiotic choice) since prior work showed no association between admission documentation and readmissions. This yielded 46 criteria (figure 2 shows the number of items in each section). We assessed nurse-abstractors’ inter-rater reliability on 20 complete records, achieving 98% observed agreement across all questions. See online supplementary appendices 2b and 5 for the final criteria and abstraction tool, respectively. (The discharge readiness/planning and post-discharge sections contained both generic and pneumonia-specific items.)

Nurses sequentially reviewed 138 of the 600 randomly chosen cases to obtain 100 fully abstracted cases. The most common reason for exclusion from full abstraction was that the patient had had a pneumonia-related admission to a non-VA hospital in the previous 30 days (n=13) (see figure 1). Clinician co-investigators (KG, JS) assisted the lead clinical investigator (AMB) in assessing antibiotic choice and dosage appropriateness from abstracted data.

Analyses

We compared fully abstracted cases with all VA pneumonia discharges with a 30-day readmission by demographics and selected Elixhauser comorbidities (using outpatient and inpatient diagnostic codes from administrative data from 12 months before the index plus the index admission), length of stay, and time to readmission. We also compared PPR—yes with PPR—no cases for these same variables, plus selected

Figure 2  Development of explicit pneumonia process of care criteria. *We also abstracted electronic medical record information in order to ascertain the diagnosis of pneumonia, as well as information on risk factors and severity of illness. These were not included in list of process of care criteria that made up the quality-of-care score.
EMR-abstracted comorbidities. We used parametric and non-parametric tests as appropriate.

Baseline analyses
We compared PPR–yes and PPR–no cases by mean quality scores as follows: (1) we scaled scores, based on achievement of specified items (yes/no), to a maximum of 25 per section and summed scores across sections (maximum obtainable quality score=100; ‘equal section weights’); (2) we weighted individual items equally (regardless of section) and scaled total scores out of 100 (ie, total score=(number of items achieved/46 items)×100; ‘equal item weights’). Higher scores indicate achievement of more process of care items and therefore higher quality.

Sensitivity analyses
We conducted several sensitivity analyses. (1) We weighted items using the mean panel rating of the item then re-run quality score methods 1 and 2 above. (2) We re-examined baseline results by modifying the original items either with respect to the numerator or denominator specification or dropping items with low achievement rates. For example, for one item, “the patient is ready for discharge if the white blood cell count closest to discharge is stable or falling compared with the admission value,” we modified the numerator to give a pass to cases only if the decrease was ≥20%. (3) Because 51% of all VA patients and 93% of those aged ≥65 are VA and Medicare dually enrolled,25 using CMS MedPar files, we examined the frequency of post-discharge Medicare use by PPR status among our abstracted sample and determined its potential impact on findings.

To further examine the association between the quality score and PPR status, we ran a multivariate logistic regression model predicting PPR status, including the overall ‘equal section weights’ score, adjusting for age, race, gender, and number of comorbidities.26 We repeated this using the ‘equal item weights’ score and individual section scores. We also repeated these logistic analyses excluding PPR–no cases ineligible for a PPR (n=8) (see online supplementary appendix 3, which shows PPR reasons among abstracted cases).

Lastly, to lend further construct validity to our methods, we examined quality score and time to readmission associations; we hypothesised that patients experiencing more quality of care problems would be readmitted sooner. For the full abstraction sample, we generated descriptive statistics of consecutive time-to-readmission intervals (0–3, 4–7, 8–14, 15–30 days) by quality score using equal section weights, then examined quality score and readmission time associations using a simple correlation, plus linear regression adjusting for age, gender, race, and number of comorbidities. We also re-examined PPR–yes vs PPR–no quality scores using 7- and 14-day readmission windows. We performed these analyses using (1) total quality score based on equal section weights; (2) section scores (scaled out of 25); and (3) total score without section D, since one would expect more opportunities to fulfil section D criteria the further from index discharge.

We compared PPR–yes and PPR–no group scores using t tests, and calculated ES, which is independent of sample size, for selected results to characterise the clinical significance of findings18 (Cohen defines an ES of 0.2, 0.5, and 0.8 as small, medium, and large, respectively). For multivariate logistic analyses, we examined ORs and 95% CIs.

RESULTS
Of the fully abstracted cases, 77% were flagged as PPR–yes, versus 72% of all pneumonia readmissions (and 77% of the potential abstraction sample of 600). Table 1 shows all pneumonia discharges with a readmission versus fully abstracted cases. There were no significant differences between these groups and no obviously associated trends despite some relatively minor comorbidity prevalence differences. For fully abstracted cases, table 1 shows PPR–yes and PPR–no characteristics. Again, no differences were significant. However, there was a trend towards more comorbidities such as chronic lung disease, HF, and liver disease, among PPR–yes cases; as expected by our methodology, PPR–no cases were more likely to have cancer. PPR–yes cases were also more likely to require intensive care unit admissions or be nursing home residents. Comorbidity differences using administrative data were also non-significant (data not shown for individual comorbidities).

PPR–yes cases had higher achievement rates than PPR–no cases on 28 of 46 process criteria, although criterion differences were not significant. Total baseline scores were slightly higher using the equal item weight method than the equal section weight method (70.4±8.7 vs 64.8±12.0) primarily because section D scores were low and contained only 22% of items. By both methods, scores were slightly higher among PPR–yes versus PPR–no cases, although differences were non-significant; however, ES were midway between small and medium for total score by both methods (>0.30) and for sections A (admission work-up) and D (0.30 and 0.40, respectively) (see table 2).

Sensitivity analyses: panel weights: We obtained similar results when weighting items using panel weights. Scores were slightly higher for all sections except section D, as were total scores, again with a non-significant trend towards higher scores among PPR–yes cases and slightly larger ES (≥0.40) (see table 2).

Individual item numerator/denominator modifications or deletion if low achievement rates: No item modifications or deletions had any meaningful effect on findings (data not shown; available from authors).
Potential Medicare use impact: Of the sample, 16% had Medicare outpatient claims between index discharge and readmission, representing 17% (n=13) of PPR–yes and 13% (n=3) of PPR–no cases (p = 1.0). Recalculating results after removing either section D or cases with non-VA post-discharge care did not alter the findings.
Quality scores as PPR status predictors: Logistic models adjusted for demographics and comorbidities showed no significant association between quality score and PPR status (all CIs included 1.0) (see table 3). Exclusion of PPR–ineligibles from PPR–no cases did not affect these results (see online supplementary appendix 4 and table 3s).

For the full sample, quality scores were higher the longer the time to readmission. This trend was most apparent for section D, but held even when section D was removed and was significant by correlations and multivariate regression modelling (see online supplementary appendix 4, figure 1s and table 2s).

### DISCUSSION

This is one of the few studies to examine whether the PPR algorithm distinguishes between good and bad quality of care at the individual case level. Among veterans readmitted after a pneumonia discharge, we found no significant difference in quality of care, as measured by processes of care received during the index admission and after discharge, between cases flagged as PPRs and non-flagged cases. Indeed, contrary to our hypothesis, quality scores were slightly higher among PPR-flagged cases.

Although both CMS and PPR measures are intended for hospital-level comparisons of risk-adjusted rates, we believe our case-level analysis is meaningful. Although both use slightly different methods to control for comorbidity, the presumption of each is that since these important drivers of readmission are controlled for, resultant high rates must be due, in part, to modifiable unmeasured factors such as quality of care.48 Thus, to try to improve rates, a hospital identified as a high outlier by either measure would have to look for more detailed information at the individual patient level to examine whether there were any quality of care problems. The PPR software attempts to improve upon the CMS measure by maximising identification of preventable readmissions (ie, those associated with quality of care problems) by matching 30-day results. PPR–yes scores were higher than PPR–no cases; however, associated ES were larger, especially for the 14-day comparison, with several differences of at least of medium clinical significance (see online supplementary appendix 4, figure 1s and table 2s).

### Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fully abstracted sample (n=100)</th>
<th>PPR–yes (n=77)</th>
<th>PPR–no (n=23)</th>
<th>p Value</th>
<th>Effect size</th>
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<tbody>
<tr>
<td><strong>Baseline analysis</strong></td>
<td></td>
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</tr>
<tr>
<td>Section A</td>
<td>19.6 (3.1)</td>
<td>19.8 (2.9)</td>
<td>18.8 (3.6)</td>
<td>0.15</td>
<td>0.32</td>
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<tr>
<td>Section B</td>
<td>18.0 (6.1)</td>
<td>18.0 (6.0)</td>
<td>17.9 (6.5)</td>
<td>0.94</td>
<td>0.02</td>
</tr>
<tr>
<td>Section C</td>
<td>20.2 (2.1)</td>
<td>20.2 (2.2)</td>
<td>20.2 (1.9)</td>
<td>0.94</td>
<td>0.02</td>
</tr>
<tr>
<td>Section D</td>
<td>7.0 (8.0)</td>
<td>7.7 (8.1)</td>
<td>4.7 (7.3)</td>
<td>0.11</td>
<td>0.39</td>
</tr>
<tr>
<td>Total score: equal section weight</td>
<td>64.8 (12.0)</td>
<td>65.8 (11.5)</td>
<td>61.6 (13.3)</td>
<td>0.14</td>
<td>0.34</td>
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<tr>
<td>Total score: equal item weight</td>
<td>70.4 (8.7)</td>
<td>71.2 (8.7)</td>
<td>67.9 (8.7)</td>
<td>0.11</td>
<td>0.38</td>
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<tr>
<td><strong>Panel weight analysis</strong></td>
<td></td>
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<tr>
<td>Section A</td>
<td>21.9 (2.9)</td>
<td>22.1 (2.8)</td>
<td>21.2 (3.3)</td>
<td>0.21</td>
<td>0.29</td>
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<tr>
<td>Section B</td>
<td>19.3 (6.2)</td>
<td>19.6 (6.1)</td>
<td>18.5 (6.4)</td>
<td>0.47</td>
<td>0.17</td>
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<td>Section C</td>
<td>19.5 (2.6)</td>
<td>19.5 (2.6)</td>
<td>19.4 (2.4)</td>
<td>0.90</td>
<td>0.03</td>
</tr>
<tr>
<td>Section D</td>
<td>6.8 (8.0)</td>
<td>7.5 (8.1)</td>
<td>4.4 (7.3)</td>
<td>0.11</td>
<td>0.39</td>
</tr>
<tr>
<td>Total score: equal section weight</td>
<td>67.5 (12.3)</td>
<td>68.7 (11.6)</td>
<td>63.6 (13.9)</td>
<td>0.08</td>
<td>0.40</td>
</tr>
<tr>
<td>Total score: equal item weight</td>
<td>74.9 (8.8)</td>
<td>75.7 (8.7)</td>
<td>72.1 (8.7)</td>
<td>0.09</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Results are shown as mean (SD).

Section A=admission work-up; section B=in-hospital evaluation and treatment; section C=discharge readiness/discharge planning; section D=post-discharge period.

Equal section weight method—totals of items within each section scaled to maximum score of 25 and summed to a maximum of 100.

Equal item weight—total of all items scaled to a maximum of 100.

PPR, Potentially Preventable Readmission.

### Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>C statistic</th>
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</thead>
<tbody>
<tr>
<td>Model 1</td>
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<tr>
<td>Total score: equal section weight</td>
<td>1.03 (0.99 to 1.08)</td>
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<td>Model 2</td>
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<td>Total score: equal item weight</td>
<td>1.05 (0.99 1.11)</td>
<td>0.695</td>
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<tr>
<td>Model 3</td>
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<td></td>
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<td>Section A score</td>
<td>1.11 (0.94 to 1.31)</td>
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<tr>
<td>Section B score</td>
<td>0.99 (0.91 to 1.08)</td>
<td></td>
</tr>
<tr>
<td>Section C score</td>
<td>1.04 (0.81 to 1.34)</td>
<td></td>
</tr>
<tr>
<td>Section D score</td>
<td>1.04 (0.97 to 1.12)</td>
<td></td>
</tr>
</tbody>
</table>

All models are adjusted for age, sex, race, and number of Elixhauser comorbidities.

Elixhauser comorbidities consist of 29 comorbidities obtained from inpatient and outpatient administrative data from year before admission up to and including the index admission.27 PPR, Potentially Preventable Readmission.

30-day results. PPR–yes scores were higher than PPR–no cases; however, associated ES were larger, especially for the 14-day comparison, with several differences of at least of medium clinical significance (see online supplementary appendix 4, figure 1s and table 2s).

**DISCUSSION**

This is one of the few studies to examine whether the PPR algorithm distinguishes between good and bad quality of care at the individual case level. Among veterans readmitted after a pneumonia discharge, we found no significant difference in quality of care, as measured by processes of care received during the index admission and after discharge, between cases flagged as PPRs and non-flagged cases. Indeed, contrary to our hypothesis, quality scores were slightly higher among PPR-flagged cases.

Although both CMS and PPR measures are intended for hospital-level comparisons of risk-adjusted rates, we believe our case-level analysis is meaningful. Although both use slightly different methods to control for comorbidity, the presumption of each is that since these important drivers of readmission are controlled for, resultant high rates must be due, in part, to modifiable unmeasured factors such as quality of care. Thus, to try to improve rates, a hospital identified as a high outlier by either measure would have to look for more detailed information at the individual patient level to examine whether there were any quality of care problems. The PPR software attempts to improve upon the CMS measure by maximising identification of preventable readmissions (ie, those associated with quality of care problems) by matching 30-day results. PPR–yes scores were higher than PPR–no cases; however, associated ES were larger, especially for the 14-day comparison, with several differences of at least of medium clinical significance (see online supplementary appendix 4, figure 1s and table 2s).

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clinically related admissions and readmissions. Despite this refinement, our findings suggest that the PPRs are no better than CMS measures in ascertaining which cases are preventable.

Consistent with existing studies, a large proportion of our readmissions were clinically related based on admission and readmission administrative codes and therefore flagged as PPRs (77%). Estimated preventable readmission rates from other chart review studies are generally much lower than observed rates obtained using the PPRs (5–79%, with a median of only 27%). Jackson et al recently compared potential preventability of readmission as assessed by clinical judgement based on triaging results from EMR review and interviews with treating providers and a subset of patients and their caregivers, with the PPRs. They identified 47% of readmissions as potentially preventable, versus 78% by the PPRs. They concluded that agreement between methods was insufficient to supplant manual review. Others have also reported concerns about the ability of PPRs to appropriately flag readmissions that are truly preventable when examined at the individual case level.

We intentionally measured quality of care using detailed explicit process of care information to improve the reliability and generalisability of findings and focus on items potentially modifiable by a hospital. Notably, the previously cited Jackson et al study used implicit review to assess preventability and included relatively few in-hospital processes of care. Moreover, the extent to which some of the concerns identified might have been dealt with is unclear (eg, inadequate attention to psychological or social needs was mentioned as an important problem contributing to preventable readmission in over half of their cases).

In general, process-outcome links supported by clinical trials have been harder to demonstrate in observational studies, especially with respect to readmissions. Of the few prior studies specifically examining explicit quality of inpatient care criteria and readmission risk, none included the post-discharge period. Further, the strongest associations have been found by aggregating individual processes of care into a single score or multiple scores representing different stages of the hospital stay rather than using individual process measures and also when examining data at the patient, rather than hospital, level.

Studies examining processes of care and readmissions of patients with pneumonia are scarce, with most focusing on few criteria. Weissman et al used a case-control design to examine the association between PPRs, defined as ‘related adverse readmissions’ based on clinician panel assessments of paired readmission diagnoses and readmission periods, and index hospitalisation quality of care for patients with pneumonia and HF. As in our study, charts were abstracted for several process criteria, including those related to the admission history, treatment/evaluation during the stay, and discharge readiness/stability. As we found, overall explicit quality scores in patients with pneumonia and related adverse readmissions were similar to those of other readmitted patients with pneumonia, but significantly lower than for non-readmitted patients. Notably, the observed association was strongest for discharge stability measures.

Other studies of pneumonia have assessed a limited number of process criteria, with relatively few examining the association with readmissions. Dean et al examined initial antibiotic choice at the hospital level, while Halm et al investigated measures of clinical stability at discharge at the patient level. Both examined the association with 30-day readmission and mortality. The former found a non-significant readmission decrease and a significant mortality decrease in hospitals that implemented a specific pneumonia antibiotic guideline. The latter found that having specific markers of clinical instability at discharge significantly increased the risk of both readmissions and death, with the risk increasing with the number of markers present.

Ours is among the first studies to examine the PPRs using detailed discharge-level EMR abstracted processes of care and go beyond the inpatient period to examine post-discharge processes. Further study strengths include use of the VA EMR, allowing access to VA-wide care information and performance of multiple sensitivity analyses, which showed consistent findings. Additionally, our preliminary findings in cohorts of patients with acute myocardial infarction and HF have been similar.

However, our study had a few limitations. (1) Our sample size might have been too small to show statistical significance. To deal with this, we calculated ES which are independent of sample size; the higher-quality scores among PPR-flagged cases represented an ES midway between small and medium, but in the opposite direction than expected. (Therefore, if our sample were larger, we might find that quality scores were significantly higher in PPR–yes cases but the ES should remain unchanged.) (2) We dropped certain criteria that were difficult to find and not clearly linked to hospitalisation or readmission (eg, whether an influenza vaccine was given). (3) We do not know whether low ‘post-discharge’ scores resulted from absence of VA care or poor EMR documentation of actual care received, although only 36% of patients had a follow-up visit to a VA provider. (4) We lacked non-VA EMR post-discharge care information. However, for both items 3 and 4, excluding post-discharge care did not change the findings. (5) Despite using a well-established consensus method to develop explicit criteria, the reproducibility of criteria selected and associated weights may vary by clinical panel. (6) We did not specifically abstract process information related to prevention or management of potential complications of care (eg,
antibiotic-related increases in international normalised ratio in patients receiving warfarin) or management of active comorbidities (eg, diabetes).

Conceptually, the PPRs represent an attractive alternative to an administrative all-cause readmission measure such as CMS or a preventability measure based on chart review. The latter would be exceedingly resource intensive and thus impracticable for large-scale implementation. However, the problems discussed above illustrate the difficulty in using administrative data-based readmission measures, such as the PPRs, to produce information that hospitals can use to reduce readmissions. These problems would exist regardless of whether one used a measure based on ICD-9 codes as in the USA, or one based on ICD-10 codes, which are used in most other countries. Reasons for readmissions are myriad with many, such as socioeconomic factors, being difficult to modify by the hospital.35 44 Similarly, there may be problems in using the EMR to determine potential preventability. Lack of EMR documentation of care, such as that delivered in the post-discharge period, is concerning. Certain processes, such as those related to patient-provider communication, may be difficult to document accurately, requiring other data collection methods such as direct observation. Nevertheless, it is important that providers are aware of the need to document all aspects of care as far as possible. Reaching out to providers, coders, and hospital senior leadership may be a necessary step in accomplishing this.

From a hospital perspective it would also be useful to be able to predict preventable readmissions in order to prevent them. At the individual readmission level, PPRs produce a categorical outcome (yes, no or ineligible). Whether the PPRs could be used to provide a probabilistic likelihood for readmission, or recalibrated/modified to identify readmissions that have a higher likelihood of being preventable, requires further investigation.

CONCLUSIONS

PPR categorisation did not reflect expected differences in quality of care received during the index admission or post-discharge period among readmitted cases. Although the PPRs represent an important step towards developing a fairer measure for hospital reimbursements than all-cause readmissions, our findings did not support their use at the individual case level. Future studies should examine whether the PPRs better discriminate quality if other data collection methods are used to capture poorly documented potentially relevant processes, or if cases are sampled from hospitals with higher and lower than expected PPR rates.

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Contributors Study conception and design: AMB, JR, AH, AK. Acquisition of data: AMB, QC, HJM. Analysis and interpretation of data: AMB, QC, JR, HJM, MS, KG, JS, AK. All authors were involved in drafting or critical revision of the manuscript, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Ethics approval The Boston VA and Bedford VA institutional review boards.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Scores for individual items and results of additional sensitivity analysis mentioned in the paper but not reported (individual item numerator/denominator modifications or deletion if low achievement rates) may be available to any interested parties by sending a request to the corresponding author.

REFERENCES


Author affiliations

1 Center for Healthcare Organization and Implementation Research, Bedford VAMC Campus, Bedford, Massachusetts, USA

2 Department of Health Policy and Management, Boston University School of Public Health, Boston, Massachusetts, USA

3 Department of Medicine, Boston University School of Medicine, Boston, Massachusetts, USA

4Center for Healthcare Organization and Implementation Research, Boston VA Campus, Boston, Massachusetts, USA

5School of Management, Boston University, Boston, Massachusetts, USA

6Department of Surgery, Boston University School of Medicine, Boston, Massachusetts, USA

7Department of Infectious Disease, VA Boston Healthcare System, Boston, Massachusetts, USA

8Department of Medicine, Harvard University School of Medicine, Boston, Massachusetts, USA


17 Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. Med Care 2003;41:582–92.


41 Borzecki A, Chen Q, Restuccia J, et al. Are readmissions flagged as potentially preventable more likely to have process of care problems than non-flagged readmissions? Applying the 3M PPR software to acute myocardial infarction patients in the Veterans Health Administration. *AcademyHealth Annual Meeting* 2014; San Diego, CA; 8 June 2014.


# Appendices

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</tbody>
</table>
Appendix 1. Literature Review Details

We searched PubMed using the Mesh Terms “Patient Readmission” AND “Pneumonia,” “Hospitalization” AND “Pneumonia,” “Quality Indicators, Healthcare” AND “Pneumonia,” and The Text Words “Preventable Readmission” from 2000 to present. We used the following filters: English Language, Humans, Items with Abstracts.

We also reviewed bibliographies of retrieved papers and selected medical texts (i.e., UpToDate) for additional references. (We included papers from prior to 2000 resulting from these searches.)

Additionally, we reviewed current clinical practice guidelines from US national societies and existing CMS/Joint Commission and Veterans Health Administration pneumonia process of care performance measures (both current and retired measures).

List of References:

Pneumonia Hospitalizations:

Preventable Readmissions:

Pneumonia Clinical Guidelines:

CMS/Joint Commission and Veterans Health Administration pneumonia process of care performance measures:
## Appendix 2. Pneumonia Process of Care Criteria

### 2a. Examples of Pneumonia Process of Care Criteria/Items

<table>
<thead>
<tr>
<th>Section</th>
<th>Clinical Item</th>
<th>Quality of Care Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A: Admission Work-Up</strong></td>
<td>The admission note should document risk factors for healthcare associated pneumonia if present</td>
<td>If the patient had an acute or subacute hospital stay in the 90 days prior to admission, then this should be documented in the admission note, to fulfill the criterion</td>
</tr>
<tr>
<td></td>
<td>Blood cultures should be performed within 24 hours of admission, with at least 1 set drawn prior to antibiotic administration</td>
<td>If pneumonia is suspected upon admission, then at least one set of blood cultures should be drawn within the first day of admission, prior to giving antibiotics, to fulfill the criterion</td>
</tr>
<tr>
<td><strong>B: In-Hospital Evaluation and Treatment</strong></td>
<td>The initial empiric antibiotic selection is consistent with the clinical picture and current national pneumonia guidelines</td>
<td>If the patient received appropriate antibiotics (type and dosage; based on clinician review of risk factors), the criterion is fulfilled</td>
</tr>
<tr>
<td><strong>C: Discharge Readiness / Planning</strong></td>
<td>The patient is ready for discharge when there is documented improvement in symptoms (e.g., dyspnea, cough) or signs of pneumonia</td>
<td>If there is documented improvement in symptoms (dyspnea, cough) or signs (e.g., decrease in fever, improved oxygen saturation) in the EMR, then the criterion is fulfilled</td>
</tr>
<tr>
<td></td>
<td>Discharge medications include oral antibiotics to complete at least a total 5-day course</td>
<td>If the patient did not complete at least 5 days of antibiotics in-hospital, then discharge medications need to include antibiotics to complete at least 5 days, to fulfill the criterion</td>
</tr>
<tr>
<td><strong>D: Post-Discharge Period</strong></td>
<td>There was a post-discharge phone call or in-person home visit, or scheduled provider visit within 72 hours of discharge</td>
<td>If there was documentation of a phone call, home visit, or scheduled provider visit within 72 hours of discharge, then the criterion is fulfilled</td>
</tr>
</tbody>
</table>
Appendix 2b. Final List of Pneumonia Processes of Care Criteria – Clinical Items

A. The Admission Work-up

The admission history should document:
A1. Allergies or intolerances to medications
A2. Adherence to medication regimen
A3. Cigarette smoking (pack-years)
A4. Alcohol use (amount per day or average drinks per week)
A5. Illicit drug use, including injection drugs
A6. If the patient had an acute or subacute (rehabilitation/geriatrics) hospital admission for at least 48 hours within the prior 90 days

The admission physical examination (MD unless otherwise specified) should include:
A7. Level of consciousness

Tests performed within 24 hours of admission should include:
A8. Blood cultures with at least one set performed prior to antibiotic administration
A9. EKG
A10. Chest x-ray (upright postero-anterior (PA) and lateral if possible)

B. Evaluation and Treatment During the Stay

Diagnostic Evaluation
B1. Obtain a sputum gram stain and culture (in patients who are producing sputum) or obtain an endotracheal aspirate for gram stain and culture in intubated patients

If pneumonia not diagnosed on admission but suspected shortly after admission:
B2. Obtain blood cultures
B3. Obtain a repeat chest x-ray (including PA and lateral; if PA/lateral not done on admission)

Treatment / Monitoring
B4. Patient is candidate for antibiotics (not palliative), and initial empiric antibiotic selection is consistent with clinical picture and current national pneumonia guidelines. *
B5. Aspiration pneumonia and coverage for anaerobes considered if appropriate history and chest x-ray findings (i.e., history of swallowing problems, altered level of consciousness, alcohol/drug abuse, seizure, right upper lobe infiltrate)
B6. Antibiotics modified based on culture findings †

B7. Antibiotic levels monitored and adjusted as appropriate (e.g. vancomycin and aminoglycosides) †

B8. Antibiotics dosed appropriately based on renal or liver function †

B9. Appropriate venous thromboembolism prophylaxis should be administered during the hospital stay until patient is fully ambulatory, unless he/she is on full-dose anticoagulation
C. Readiness for Discharge Criteria

Clinical Stability

_The patient admitted for pneumonia is ready for discharge when:_

C1. Documented improvement in symptoms (e.g., dyspnea/cough) has occurred
C2. White blood cell count is stable or falling, not rising
C3. Blood urea nitrogen is stable or falling, not rising
C4. Creatinine is stable or falling, not rising

_None of the following have occurred within 24 hrs of discharge (Halm, Arch Intern Med 2002):_

C5. Systolic blood pressure ≤90 mm Hg (in patient whose baseline BP is > 90 mm Hg)
C6. Heart rate >100 bpm (in patient whose baseline is <100)
C7. Respiratory rate >24 /min (in patient whose baseline is <24)
C8. Temperature >100°F
C9. Room air oxygen saturation <90% (in patient not previously on home oxygen) or patient discharged on home oxygen when not previously on this.
C10. Altered mental status
C11. Inability to maintain enteral intake, either orally or by other means (e.g., PEG tube)

Discharge Planning

C12. Discharge medications include oral antibiotics to complete at least a total 5-day course

_There is documentation in the chart that the patient or family:_

C13. Received written discharge instructions or other educational material regarding all of the following: 1) activity level, 2) diet, 3) discharge medications, 4) follow-up appointment
C14. Understands the medication regimen

_Plans for post discharge medical care are stated in the chart and/or discharge summary, including:_

C15. List of discharge medications, with medication reconciliation including specific medication changes made compared to admission medications
C16. Follow-up clinic visit arranged with primary care provider or specialist (infectious disease or pulmonology) as appropriate
C17. Discharge summary completed by time of follow-up visit, and therefore available to follow-up provider
D. Post-Discharge Period

There should be documentation that the following occurred:

D1. There was a post-discharge phone call or in-person home visit within 72 hours to the patient by a nurse or other healthcare staff or scheduled provider office visit within 72 hours

If there was a post-discharge phone call / home visit it consisted of:

D2. Patient asked about any change in condition since discharge including breathing and cough
D3. Patient asked about his/her understanding of what the medications are for
D4. Review of pending clinic appointments and tests
D5. Reinforcement of other discharge instructions including recommended diet and what to do if symptoms worsen

Follow-up Provider Visit

D6. There was a follow-up visit with the provider prior to readmission

At follow-up visit with provider, if the visit occurred at least a day before the readmission date, the following should be documented:

D7. Patient’s current functional status including exercise tolerance with respect to breathing and ability to perform activities of daily living
D8. If medications changed or discontinued, appropriate justification given
D9. Medications reconciled including updating medication list
D10. Provider’s awareness of pending tests

Notes:

* Item B4 was addressed by review of each case by the study lead (Dr. Borzecki) and clinical co-investigators (Drs. Gupta and Strymish) using abstracted information, and in several cases, going back to the chart for additional details.

In order to assess antibiotic appropriateness, we included several questions about risk factors for drug resistance, disease severity, and increased risk for certain pathogens that might affect antibiotic choice (e.g., additional questions about healthcare associated pneumonia risk including being a long-term care resident, attendance at a hemodialysis clinic or hospital clinic for wound care or IV therapy in the prior 30 days, immunosuppressive disease history, use of immunosuppressive treatment including steroids or recent antibiotic use).

† Items B6, B7, and B8 were also reviewed by study lead and clinical co-investigators noted above.
Appendix 3. Reasons for PPRs among Fully Abstracted Cases

<table>
<thead>
<tr>
<th>Reasons for PPR-Yes Cases</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical readmission for a continuation or recurrence of the reason for the initial admission, or for a closely related condition</td>
<td>52</td>
</tr>
<tr>
<td>Ambulatory care sensitive conditions as designated by ARHQ*</td>
<td>14</td>
</tr>
<tr>
<td>All other readmissions for a chronic problem that may be related to care either during or after the initial admission</td>
<td></td>
</tr>
<tr>
<td>Readmission for a substance abuse diagnosis reason following an initial admission for a non-mental health, non-substance abuse reason.</td>
<td>2</td>
</tr>
<tr>
<td>Readmission for surgical procedure to address a complication that may be related to or may have resulted from care during the initial admission.</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reasons for PPR-No Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not clinically related</td>
</tr>
<tr>
<td>Ineligible for a PPR†</td>
</tr>
<tr>
<td>Malignancy‡</td>
</tr>
<tr>
<td>Clinically related, not preventable</td>
</tr>
</tbody>
</table>

* Specific to pneumonia discharges, readmissions with a diagnosis of pneumonia are considered as a “medical readmission for a continuation or recurrence of the reason for the initial admission . . .” and not as an ambulatory care sensitive condition.

†Includes: 5 “major/metastatic malignancy”, and 1 “non-event malignancy.” The PPR algorithm designates patients with “major/metastatic malignancy” as ineligible for a PPR because they are considered to be at very high risk for readmission due to their medical condition and thus hard to prevent. For our study, we considered ineligible patients as PPR-No cases.

‡ Includes one known case of lung cancer from index admission, 1 case of lung cancer diagnosed after the index admission and 1 case of lymphoma with malignant effusion from the index admission. Of note, there were 8 cases of malignancy among the PPR-Yes cases (6 of which were lung cancer.)
Appendix 4. Time to Readmission and Quality Score Analyses

Table 1s. Time to Readmission and Quality Score. Consecutive Intervals

<table>
<thead>
<tr>
<th>Time to Readmission</th>
<th>N</th>
<th>Total Score</th>
<th>Section A</th>
<th>Section B</th>
<th>Section C</th>
<th>Section D</th>
<th>Section ABC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 days</td>
<td>19</td>
<td>57.1 (12.0)</td>
<td>18.6 (3.5)</td>
<td>15.9 (6.9)</td>
<td>19.6 (2.2)</td>
<td>3.0 (7.3)</td>
<td>54.1 (8.5)</td>
</tr>
<tr>
<td>4-7 days</td>
<td>22</td>
<td>61.9 (12.0)</td>
<td>18.2 (4.0)</td>
<td>17.6 (7.1)</td>
<td>20.2 (1.6)</td>
<td>5.9 (6.8)</td>
<td>56.0 (9.2)</td>
</tr>
<tr>
<td>8-14 days</td>
<td>20</td>
<td>64.9 (9.3)</td>
<td>20.1 (2.6)</td>
<td>16.4 (5.5)</td>
<td>20.4 (2.2)</td>
<td>8.1 (7.7)</td>
<td>56.9 (5.5)</td>
</tr>
<tr>
<td>15-30 days</td>
<td>39</td>
<td>70.1 (11.1)</td>
<td>20.6 (1.9)</td>
<td>20.1 (4.9)</td>
<td>20.4 (2.2)</td>
<td>9.0 (8.5)</td>
<td>61.1 (6.0)</td>
</tr>
</tbody>
</table>

Section:  A = admission work-up; Section B = in-hospital evaluation and treatment; Section C = discharge readiness/discharge planning; Section D = post-discharge period.

Total score and section score calculated using equal section weight method – totals of items within each section scaled to maximum score of 25 and summed to maximum of 100 for the four sections.

SD = standard deviation

We also examined the correlation between quality scores and time to readmission, as well as running linear regression models with time to readmission as the dependent variable with adjustment for age, gender, race, and comorbidity count. We found a significant positive association between total quality score and time to readmission ($r = 0.45$, $p < 0.0001$; $r^2 = 0.25$ for model, time to readmit parameter estimate 0.33, $p < 0.0001$ in the multivariate model). (This association also held when we removed Section D; $r = 0.35$, $p = 0.0003$; $r^2 = 0.12$ for model, time to readmit parameter estimate 0.39, $p = 0.0006$.)
Section: A = admission work-up; Section B = in-hospital evaluation and treatment; Section C = discharge readiness/discharge planning; Section D = post-discharge period.

Total score and section scores calculated using equal section weight method – totals of items within each section scaled to maximum score of 25 and summed to maximum of 100 for the four sections.

See Table 2 below for information on p values and effect size.
Table 2s. Association of Quality Score and PPR Status using 7 and 14 Day Readmission Windows

| Variable, Mean (SD) | 7 days | | | | 14 days | | | |
|---------------------|--------|-----------------|-----------------|--------|--------|-----------------|-----------------|--------|--------|
|                     | PPR-Yes (N=33) | PPR-No (N=8) | P value | ES | PPR-Yes (N=48) | PPR-No (N=13) | P value | ES |
| Total Score         | 60.8 (11.8) | 55.1 (12.9)    | 0.23    | 0.48 | 62.9 (11.3) | 56.0 (10.8) | 0.05 | 0.63 |
| Section A           | 18.7 (3.6) | 16.8 (4.0)     | 0.19    | 0.51 | 19.4 (3.3) | 17.4 (4.0) | 0.07 | 0.55 |
| Section B           | 17.2 (6.5) | 15.4 (8.8)     | 0.51    | 0.24 | 17.0 (6.4) | 15.6 (6.8) | 0.49 | 0.21 |
| Section C           | 19.8 (1.9) | 20.6 (2.0)     | 0.24    | 0.46 | 19.9 (2.1) | 20.6 (1.7) | 0.29 | 0.35 |
| Section D           | 5.1 (7.5)  | 2.3 (4.7)      | 0.33    | 0.44 | 6.6 (7.8)  | 2.4 (4.8)  | 0.07 | 0.65 |
| Section ABC         | 55.7 (8.5) | 52.8 (10.2)    | 0.41    | 0.33 | 56.3 (7.7) | 53.6 (8.3) | 0.27 | 0.34 |

Section: A = admission work-up; Section B = in-hospital evaluation and treatment; Section C = discharge readiness/discharge planning; Section D = post-discharge period.

Total score and section score calculated using equal section weight method – totals of items within each section scaled to maximum score of 25 and summed to maximum of 100.

SD = standard deviation, ES = effect size

Table 3s. Association of Quality Score and PPR Status (PPR-Yes vs. PPR-No); PPR-Ineligible Cases Removed

<table>
<thead>
<tr>
<th>Variable (N=92)</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>C Statistic</th>
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</thead>
<tbody>
<tr>
<td><strong>Model 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score: equal section weight</td>
<td>1.03</td>
<td>(0.98, 1.08)</td>
<td>0.694</td>
</tr>
<tr>
<td><strong>Model 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score: equal item weight</td>
<td>1.04</td>
<td>(0.97, 1.12)</td>
<td>0.694</td>
</tr>
<tr>
<td><strong>Model 3</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Section A Score</td>
<td>1.08</td>
<td>(0.88, 1.31)</td>
<td>0.706</td>
</tr>
<tr>
<td>Section B Score</td>
<td>1.00</td>
<td>(0.90, 1.10)</td>
<td></td>
</tr>
<tr>
<td>Section C Score</td>
<td>0.98</td>
<td>(0.73, 1.32)</td>
<td></td>
</tr>
<tr>
<td>Section D Score</td>
<td>1.04</td>
<td>(0.95, 1.13)</td>
<td></td>
</tr>
</tbody>
</table>
### SECTION A: DEMOGRAPHIC INFORMATION

<table>
<thead>
<tr>
<th>#</th>
<th>QUESTION</th>
<th>RESPONSE</th>
<th>DATA SOURCE(S)</th>
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<tbody>
<tr>
<td>A1</td>
<td>GENDER</td>
<td>Male</td>
<td>Patient Information Demographics Patient Inquiry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Not documented</td>
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</tr>
<tr>
<td>A2</td>
<td>DATE OF BIRTH</td>
<td>MM/DD/YYYY</td>
<td>Patient Information Demographics Patient Inquiry</td>
</tr>
<tr>
<td>A3</td>
<td>RACE/ETHNICITY</td>
<td>White</td>
<td>Patient Information Demographics Patient Inquiry</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Hispanic Black</td>
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<td>Native American</td>
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<tr>
<td></td>
<td></td>
<td>Asian</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Not documented</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>ADMISSION DATE</td>
<td>MM/DD/YYYY</td>
<td>Sample sheet</td>
</tr>
<tr>
<td>A5</td>
<td>DISCHARGE DATE</td>
<td>MM/DD/YYYY</td>
<td>Sample sheet</td>
</tr>
<tr>
<td>A6</td>
<td>READMISSION DATE</td>
<td>MM/DD/YYYY</td>
<td>Patient Admissions</td>
</tr>
</tbody>
</table>

### SECTION A. ASCERTAINMENT OF EVENT

<table>
<thead>
<tr>
<th>#</th>
<th>QUESTION</th>
<th>RESPONSE</th>
<th>DATA SOURCE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7</td>
<td>Was the patient diagnosed with PNA?</td>
<td>YES</td>
<td>Discharge summary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO, STOP abstraction &amp; explain below</td>
<td></td>
</tr>
<tr>
<td>A8</td>
<td>Was the patient admitted to an outside hospital (for at least 24hrs) with diagnosis of PNA, within 30 days prior to index admission?</td>
<td>YES, STOP abstraction &amp; explain below</td>
<td>Admission note</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO/Not documented</td>
<td></td>
</tr>
<tr>
<td>A17</td>
<td>Did the patient have PNA treated on a prior VA admission within 30 days prior to the index admission that didn't get coded for pneumonia?</td>
<td>YES, STOP abstraction &amp; explain below</td>
<td>Admission note</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>Did the patient have an infiltrate or consolidation on CXR</td>
<td>☐ YES  ☐ NO, STOP abstraction &amp; explain below</td>
<td>Admission note, radiology</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>A10</td>
<td>Did the patient have any of the following?</td>
<td>☐ New or increased cough  ☐ Dyspnea  ☐ Abnormal Temp (≤96.8 or ≥100°F), or report of fever, chills/rigors  ☐ Leukocytosis (WBC &gt;11.0) Value of WBC (at admission or first available) [XX.X] Enter -888 if not available  ☐ Leucopenia (&lt;3.5)  ☐ NO/Not documented – STOP abstraction &amp; explain below</td>
<td>Admission note Discharge Summary</td>
</tr>
<tr>
<td>SA11</td>
<td>Was the patient discharged against medical advice (AMA) from the index admission?</td>
<td>☐ YES, STOP abstraction &amp; explain below  ☐ NO</td>
<td>Discharge summary Progress note MD Order (Irregular Discharge)</td>
</tr>
</tbody>
</table>

IF NO= A.7 , A9, A10 or YES=A.8, SA11, A17, please STOP abstraction and indicate why patient record was selected for abstraction in the space provided:

A11. 

Explain here

More room if needed

More room if needed

More room if needed

More room if needed

More room if needed

DETERMINATION OF WHETHER READMISSION WAS PLANNED

A12 | Was the patient readmitted for a planned test or treatment (e.g., colonoscopy, chemotherapy, blood transfusion)? | ☐ YES, STOP abstraction & explain below  ☐ NO | Admission note (for readmission period) |

IF YES= A.12, please STOP abstraction and explain in the space provided:

More room if needed
**ADVANCED DIRECTIVES/ DO NOT RESUSCITATE (DNR) STATUS:**

<table>
<thead>
<tr>
<th>A14</th>
<th>Was an order for Advanced Directives (DNR/DNI), written in the first 48 hours of admission?</th>
<th>DNR,DNI note Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ YES, Answer A15 and A16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ NO</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A15</th>
<th>If YES to previous question A14, which ADs were listed?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ DNR/DNI</td>
</tr>
<tr>
<td></td>
<td>☐ palliative care</td>
</tr>
<tr>
<td></td>
<td>☐ comfort care measures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A16</th>
<th>If YES to question A14, was it documented in the record that antibiotics were not used because of advanced directive status?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ YES</td>
</tr>
<tr>
<td></td>
<td>☐ NO</td>
</tr>
<tr>
<td></td>
<td>☐ N/A</td>
</tr>
</tbody>
</table>

**SECTION B. HISTORY OF PRESENT ILLNESS**

**The admission history should document:**

<table>
<thead>
<tr>
<th>B2</th>
<th>Check all that apply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ Diabetes</td>
</tr>
<tr>
<td></td>
<td>☐ COPD/Asthma, Answer B3</td>
</tr>
<tr>
<td></td>
<td>☐ Bronchiectasis, Answer B3</td>
</tr>
<tr>
<td></td>
<td>☐ Exacerbations in the past year?</td>
</tr>
<tr>
<td></td>
<td>☐ Yes</td>
</tr>
<tr>
<td></td>
<td>☐ No / No documentation</td>
</tr>
<tr>
<td></td>
<td>☐ Episode of pneumonia in the past year</td>
</tr>
<tr>
<td></td>
<td>☐ Other lung disease, Answer B4</td>
</tr>
<tr>
<td></td>
<td>☐ Patient on home O₂</td>
</tr>
<tr>
<td></td>
<td>☐ Congestive Heart Failure – chronic (L +/- R sided HF)</td>
</tr>
<tr>
<td></td>
<td>☐ Renal disease, Answer B5 &amp; B6</td>
</tr>
</tbody>
</table>
B5: stage if available \(XXX\) (if unavailable, enter 888)

B6: hemodialysis prior 30 days (HAP):
- YES
- NO
- N/A

- Liver disease, Answer B7
  B7: does the patient have any of:
  - Hepatic coma
  - Portal hypertension
  - Ascites
  - Esophageal varices
  - Other sequelae of chronic liver disease, specify
    Type in here

- Immunosuppressive state, Answer B9
  B9: Check all that apply:
  - HIV/AIDS
  - Transplant, if yes, specify below
    Type in here
  - S/P Splenectomy,
  - Severe Malnutrition
  - Neutropenia, Panocytopenia
  - Other (see guidelines), Answer B10
  B10: Specify
    Type in here
  - Chronic Corticosteroid use = e.g., Prednisone > 10mg for more than 14 days (or equivalent)

- Trach within prior 30 days (HAP & swallowing risk)

- Swallowing problems or aspiration risk, Answer B11
  B11: Check all that apply:
  - Recent h/o altered LOC (\(\leq\) 1 week)
  - Alcohol abuse/Alcoholism
  - Drug abuse
  - Recent seizure (\(\leq\) 1 week)
  - Stroke
  - Alzheimer’s Disease/ Dementia
Any special circumstance you would like to note for this section (B), please type in below.

Type-in here

More room

More room

SECTION C. RELEVANT RECENT MEDICATION USE

The admission history should document:

C1  Was there documentation in the admission note/history of use of antibiotics or systemic corticosteroids in the past month?  

☐ YES, answer C2

C2: Check all that apply

☐ Antibiotics, answer C3

C3a: Abx Received #1

Type in here

C3b: Abx Received #2

Type in here

C3c: Abx Received #3

Type in here
| C4 | Was the patient asked about allergies/intolerance s to medications? | | \( \square \) Systemic corticosteroids | | \( \odot \) NO | | \( \odot \) YES, answer C5 | | C5: were there allergies/intolerances listed for Abx? | | \( \odot \) YES, answer C6 and C7 | | C6: Which abx? | Type in here | | C7: Nature of reaction? | Type in here | (if unavailable, enter N/A) | \( \odot \) NO | | \( \odot \) N/A | \( \odot \) NO |
| C8 | Was patient asked about adherence to medication regimen? | | \( \odot \) YES, answer C9 | | C9: Did patient adhere to the med regimen? | | \( \odot \) YES | | \( \odot \) NO | | \( \odot \) N/A | | \( \odot \) NO/Not Documented |

Any special circumstance you would like to note for this section C, please type in below.

Type-in here

More room

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**SECTION D. SOCIAL HISTORY**

**The admission history should document:**

<p>| D1 | Was the patient asked if s/he is currently smoking? | | ( \odot ) YES, answer D2 | | D2: Is the patient a smoker? | | ( \odot ) Currently smoking | | Admission note/history Nurses' assessment |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Options</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>D3</td>
<td>Was the patient asked about his/her alcohol use?</td>
<td>☐ YES, answer D4</td>
<td>☐ NO/Not Documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D4: Is the patient using alcohol?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ YES, answer D5 and D6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D5: AUDIT C score</td>
<td>Type in here</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D6: Drinks per week</td>
<td>Type in here</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D15 Other description of use:</td>
<td>Type in here</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO/Not Documented</td>
<td></td>
</tr>
<tr>
<td>D7</td>
<td>On admission, was patient asked about illicit drug use/abuse?</td>
<td>☐ YES, Answer D8</td>
<td>☐ NO/Not Documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D8: Is the patient using drugs?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ YES, answer D9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D9: List drugs</td>
<td>Type in here</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(If unavailable, enter N/A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO / Not documented</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO/ Not Documented</td>
<td></td>
</tr>
<tr>
<td>D10</td>
<td>Was the patient admitted from a LTC facility or Nursing Home? (HAP risk)</td>
<td>☐ YES</td>
<td>☐ NO/Not Documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO/Not Documented</td>
<td></td>
</tr>
<tr>
<td>D11</td>
<td>Was there documentation that the patient had an acute hospital admission or subacute hospital admission (e.g., rehab/geriatrics) within the past 90 days, with D12 Did patient have an acute hospital admission within the past 90 days, LOS at least 48hrs?</td>
<td>☐ YES</td>
<td>☐ NO/ Not Documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ NO/ Not Documented</td>
<td></td>
</tr>
</tbody>
</table>
### SECTION E. PHYSICAL EXAM (MD unless otherwise specified)

**The Initial Assessment should include:**

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>YES/NO/No Documentation</th>
<th>Admission Note MD(PE)</th>
<th>Admission Note MD(HPI)</th>
<th>Admission Note MD(PE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Was level of consciousness (LOC) or mental status documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2</td>
<td>Enter patient’s most recent height and weight:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a: Height: xxx (inches)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b: Weight: xxx (pounds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TESTS PERFORMED WITHIN 24 HOURS OF ADMISSION should include:**

**Serum markers**

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>Lab values: (if any are unavailable, enter 888)</th>
<th>ER/UC note</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3</td>
<td>Please document lab values upon presentation or first available (if not</td>
<td>Creatinine xxx mg/dL eGFR xxx BUN xxx</td>
<td>Labs: Chemistry and hematology</td>
</tr>
<tr>
<td></td>
<td>completed until later).</td>
<td>Date of this value MM/DD/YYYY</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter 1/1/9999 if NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>YES/NO/No Documentation</th>
<th>ER/UC note</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4</td>
<td>Was (at least) one set of blood cultures performed?</td>
<td></td>
<td>Labs: Microbiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO/No Documentation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>YES/NO/No documentation</th>
<th>ER/UC note</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5</td>
<td>Did patient have an EKG done?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO/not documented (answer E6)</td>
<td></td>
</tr>
<tr>
<td>E6</td>
<td>Was patient put on telemetry</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO / unable to determine</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>YES/NO/Not Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>E7</td>
<td>Was a Chest X-Ray completed?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NO/Not Documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Done at outside hospital</td>
</tr>
</tbody>
</table>
SECTION F: DIAGNOSTIC EVALUATION

F1 Was PNA diagnosed on admission?
- YES
- NO/Not Documented, answer F2

F2: If pneumonia not diagnosed on admission but suspected shortly after admission (≥ 24 hr), were the following done (check all that apply):
- Blood cultures
- Chest x-ray (PA & lateral if not done on admission)

F3 Was a sputum specimen for gram stain & culture obtained (includes endotracheal aspirate if intubated)?
- YES
- NO/Not Documented

If no, was there a documentation of doc's order?
- YES
- NO/Not Documented

FN 3 Were any cultures positive? (check all that apply)
- Blood culture, please record:
  - number of bottles drawn
  - number of bottles positive
  - Dates positive
  - Organism
- Sputum culture
  - Dates positive
  - Organism
- Urine culture with >100,000 organisms
  - Dates positive
  - Organism
<table>
<thead>
<tr>
<th>F4</th>
<th>Was there evidence of a new or worsening pulmonary infiltrate (or consolidation) on CXR?</th>
<th>YES</th>
<th>NO</th>
<th>Adm. note/history Radiology (first available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5</td>
<td>Was there evidence of multi-lobar disease (2 or more lobes involved) or pleural effusion on x-ray?</td>
<td>YES, answer F6</td>
<td>NO, answer F7</td>
<td>Adm. note/history Radiology – First (abnormal) available</td>
</tr>
<tr>
<td>F6</td>
<td>Check all that apply: Multi-lobar, Pleural effusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F7</td>
<td>Were additional diagnostic tests performed? (as directed by signs/symptoms &amp; host factors/exposures, diagnosis uncertain, or patient not responding to treatment)</td>
<td>YES, answer F8</td>
<td>NO, answer F9</td>
<td>Discharge Summary Labs: Microbiology Radiology</td>
</tr>
<tr>
<td>F8</td>
<td>Check all that apply: Microbiology: Viral testing, Answer F9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F9</td>
<td>Specify: Type in here</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV</td>
<td>Pneumocystis pneumonia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPD</td>
<td>Sputum for AFB (Tb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legionella</td>
<td>CT chest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Catheter tip

Dates positive

Organism

Other culture, specify

Dates positive

Organism

No positive cultures
Any special circumstance you would like to note for this section (F), please type in below.

Type-in here

More room

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SECTION G. TREATMENT/MONITORING

G1 Did patient have an in-house consult for palliative Care?
   □ YES
   □ NO/Not Documented

G2 ANSWER IF READMISSION WAS FOR DVT (N1):
   □ YES
   □ NO, answer G2e
   G2e: Select one:
      □ Contraindicated
      □ Pt on full-dose anticoagulation
      □ Other, answer G3
   G3: Specify.
      Type in here
   □ Not Documented

G4 Was the patient admitted to ICU?
   □ YES, answer G5
   G5: Check all that apply
      □ within 24hrs of presentation
      □ anytime during stay
   □ Not Documented

If any are checked, answer F11.
F11: Write in justification for test:

Type in here

More space if needed

□ NO/Not Documented
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No/Not Documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was there documentation that aspiration pneumonia was considered?</td>
<td>☐ YES</td>
<td>☐ NO/Not Documented</td>
</tr>
</tbody>
</table>

**G7n8 Antibiotics received in hospital (Do not include if only 1 dose received in ED)**

1st abx name: [Type in here]

1st abx dosage/dosing interval: [Type in here]

Start date: [xx/xx/xxxx]

Stop date: [xx/xx/xxxx]

If started >24 hours after admission, reason?

- Positive Blood or Respiratory culture, Answer the following Document organism: [Type in here]
  
  Date of positive culture: [xx/xx/xxxx]

- Replacing abx to which patient had reaction

- Worsening condition

- Other reason, explain: [Type in here]

- Unable To Determine

If stopped before day of discharge, reason?

- Positive Blood & Respiratory culture, Answer the following Document organism: [Type in here]
  
  Date of positive culture: [xx/xx/xxxx]

- Reaction to abx during treatment

- Worsening condition
2nd abx name: 
(type in here)

If only 1 abx, type in "n/a".

2nd abx dosage/dosing interval: 
(type in here)

Start date: xx/xx/xxxx
Stop date: xx/xx/xxxx

If started >24 hours after admission, reason?

☐ Positive Blood or Respiratory culture, Answer the following
Document organism: 
(type in here)

Date of positive culture xx/xx/xxxx

☐ Replacing abx to which patient had reaction

☐ Worsening condition

☐ Other reason, explain
(type in here)

☐ Unable To Determine

If stopped before day of discharge, reason?

☐ Positive Blood & Respiratory culture, Answer the following
Document organism: 
(type in here)

Date of positive culture xx/xx/xxxx

☐ Reaction to abx during treatment

☐ Worsening condition

☐ Other reason, explain
(type in here)
3rd abx name: type in here

If only 2 abx, type in "n/a".

3rd abx dosage/dosing interval: type in here

Start date: xx/xx/xxxx
Stop date: xx/xx/xxxx

If started >24 hours after admission, reason?

- Positive Blood or Respiratory culture, Answer the following
  Document organism: type in here
  Date of positive culture xx/xx/xxxx

- Replacing abx to which patient had reaction

- Worsening condition

- Other reason, explain type in here

- Unable To Determine

If stopped before day of discharge, reason?

- Positive Blood & Respiratory culture, Answer the following
  Document organism: type in here
  Date of positive culture xx/xx/xxxx

- Reaction to abx during treatment

- Worsening condition

- Other reason, explain type in here

- Unable To Determine
4th abx name: type in here

if only 3 abx, type in "n/a".

4th abx dosage/dosing interval: type in here

Start date: xx/xx/xxxx
Stop date: xx/xx/xxxx

If started >24 hours after admission, reason?

☐ Positive Blood or Respiratory culture, Answer the following
   Document organism: type in here
   Date of positive culture xx/xx/xxxx

☐ Replacing abx to which patient had reaction

☐ Worsening condition

☐ Other reason, explain
   type in here

☐ Unable To Determine

If stopped before day of discharge, reason?

☐ Positive Blood & Respiratory culture, Answer the following
   Document organism: type in here
   Date of positive culture xx/xx/xxxx

☐ Reaction to abx during treatment

☐ Worsening condition

☐ Other reason, explain
   type in here

☐ Unable To Determine

5th abx name: type in here

if only 4 abx, type in "n/a".
5th abx dosage/dosing interval:
type in here

Start date: xx/xx/xxxx
Stop date: xx/xx/xxxx

If started >24 hours after admission, reason?
- Positive Blood or Respiratory culture, Answer the following
  Document organism:
  type in here
  Date of positive culture xx/xx/xxxx

- Replacing abx to which patient had reaction

- Worsening condition

- Other reason, explain
  type in here

- Unable To Determine

If stopped before day of discharge, reason?
- Positive Blood & Respiratory culture, Answer the following
  Document organism:
  type in here
  Date of positive culture xx/xx/xxxx

- Reaction to abx during treatment

- Worsening condition

- Other reason, explain
  type in here

- Unable To Determine

6th abx name:
type in here

6th abx dosage/dosing interval:
type in here
Start date: [xx/xx/xxxx]
Stop date: [xx/xx/xxxx]

If started >24 hours after admission, reason?

- Positive Blood or Respiratory culture, Answer the following
  Document organism: [type in here]
  Date of positive culture [xx/xx/xxxx]

- Replacing abx to which patient had reaction
- Worsening condition
- Other reason, explain [type in here]

- Unable To Determine

If stopped before day of discharge, reason?

- Positive Blood & Respiratory culture, Answer the following
  Document organism: [type in here]
  Date of positive culture [xx/xx/xxxx]

- Reaction to abx during treatment
- Worsening condition
- Other reason, explain [type in here]

- Unable To Determine
If patient on vancomycin for >3 days please write in antibiotic level

Select one:
- trough, answer G14
- random, answer G14

G14: Initial level:

- no level available
- not applicable (Patient not on this antibiotic or on for less than specified time frame/# doses)

If patient on aminoglycoside for >1 dose, please write in antibiotic level

Select one:
- On aminoglycoside, answer G16 and G17
- Not applicable (Patient not on this antibiotic or on for less than specified time frame/# doses)

G16: Initial trough level

G17: Initial peak level

(If unavailable enter 88)

Was patient discharged on antibiotics?

- YES, answer G19
- NO

Any special circumstance you would like to note for this section (G), please type in below.

Type-in here

More room

More room

SECTION H. CLINICAL STABILITY

The patient admitted for pneumonia is ready for discharge when:

H1 Did the patient have documented improvement in signs or symptoms of pneumonia? (e.g. dyspnea/cough/decrease in fever)

- YES
- NO
- Not Documented

Progress notes
<table>
<thead>
<tr>
<th>H2</th>
<th>Please check if the following lab values were drawn, and if so, record last two values</th>
<th>Lab summary</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check all that apply:</td>
<td>Check all</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WBC, Answer H3 -H6</td>
<td>WBC, Answer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last WBC before discharge</td>
<td>H3 -H6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX K/cmm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H4: Last WBC before discharge</td>
<td>H4: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX K/cmm</td>
<td>H4: Last WBC before discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td>H4: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BUN, Answer H7-H10</td>
<td>BUN, Answer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last BUN before discharge</td>
<td>H7-H10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX K/cmm</td>
<td>H7: Last BUN before discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td>H7: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Previous BUN</td>
<td>Previous BUN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX K/cmm</td>
<td>H8: Previous BUN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td>H8: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Creatinine, Answer H11-H14</td>
<td>Creatinine,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last creatinine before discharge</td>
<td>H11-H14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX K/cmm</td>
<td>H11: Last creatinine before discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td>H11: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H12: Date MM/DD/YYYY</td>
<td>H12: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H13: Previous creatinine</td>
<td>H13: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date MM/DD/YYYY</td>
<td>H14: Date</td>
<td></td>
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<tr>
<td></td>
<td>H14: Date MM/DD/YYYY</td>
<td>H14: Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Labs drawn</td>
<td>No Labs</td>
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<td></td>
<td></td>
<td>drawn</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H15</th>
<th>Have any of the following occurred on the day of discharge?</th>
<th>Vital signs</th>
<th>Nurse/resident discharge note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check all that apply:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SBP &lt; 90 mm Hg</td>
<td>SBP &lt; 90 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heart rate &gt; 100bpm</td>
<td>Heart rate</td>
<td></td>
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<tr>
<td></td>
<td>Respiratory rate &gt;24/min</td>
<td>Respiratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature &gt;100° F</td>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O2 sats on RA &lt;90% (inpatient, not on home O2)</td>
<td>O2 sats on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discharged on home O2 and was not on prior to admission (If checked</td>
<td>Discharged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>answer H15fe)</td>
<td>on home O2</td>
<td></td>
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<tr>
<td></td>
<td>H15fe: Specify O2 amount and delivery</td>
<td>H15fe:</td>
<td></td>
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<td></td>
<td>Type in here</td>
<td>Specify O2</td>
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<td>amount and</td>
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<td>delivery</td>
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<td></td>
<td>None have occurred</td>
<td>None have</td>
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<td></td>
<td>No documentation</td>
<td>No</td>
<td></td>
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<td></td>
<td></td>
<td>documentation</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>H16</th>
<th>Did the patient have altered mental status or level of consciousness (worse than baseline) within 24 hrs of</th>
<th>Nurse/resident discharge notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check all that apply:</td>
<td></td>
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<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Documented</td>
<td></td>
</tr>
</tbody>
</table>

34
### SECTION J: DISCHARGE PLANNING

**J1 Patient was discharged to:**
- [ ] Home
- [ ] Skilled Nursing Facility
- [ ] Assisted Living Facility
- [ ] Rehabilitation Facility
- [ ] Other, answer J2

**J2: Specify.**

**Jn3 Did the patient complete at least 5-days of antibiotics in hospital**
- [ ] YES, skip to J4
- [ ] NO, answer J3
- [ ] NOT documented, answer J3

**J3 Did discharge medications include antibiotics to complete (at least) a total 5-day course?**
- [ ] YES
- [ ] NO
- [ ] Not Documented

**J4 Is there documentation in the record, that the patient/family received written discharge instructions or other educational material regarding the following?**
- [ ] Discharge meds
- [ ] Follow-up appointment (documentation of specific information)
- [ ] Documentation given to caretakers (non-family members, e.g., nursing home staff)
- [ ] No documentation

**Jn5 Is there documentation**
- [ ] YES

**Discharge note**

**Social worker note**

**Interagency transfer note**

**Discharge instructions**

**Discharge summary**

**Discharge plan/Progress notes**

**Nurses’ discharge**
<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>That patient/family understood the medication regimen?</td>
<td>NO/Not Documented/Unable to determine</td>
<td></td>
</tr>
</tbody>
</table>

**J7 Were plans for post discharge medical care stated in the chart and/or discharge summary?**

To include: (Check all that apply)

**Medication:**
- [ ] List of discharge meds
- [ ] Med reconciliation

**Follow-up clinic visit:**
- [ ] f/u clinic visit arranged with PCP or specialist (infectious disease or pulmonology) Answer J8 and J9.
  - First visit:
    - J8a: Type of provider
      - Type in here
    - J9a: Date visit scheduled:
      - [ ] MM/DD/YYYY
      - (enter 1/1/9999 if unavailable)
  - Second visit:
    - J8b: Type of provider
      - Type in here
    - J9b: Date visit scheduled:
      - [ ] MM/DD/YYYY
      - (enter 1/1/9999 if unavailable)
  - Third visit:
    - J8c: Type of provider
      - Type in here
    - J9c: Date visit scheduled:
      - [ ] MM/DD/YYYY
      - (enter 1/1/9999 if unavailable)

- [ ] Pt advised to call PCP to arrange follow-up clinic visit
- [ ] NA (e.g., pt discharged to nursing home or hospice).
  - Explain:
    - [ ]

**Recommendations for:**
- [ ] med changes as applicable
  - Specify or list

*Discharge instructions
  *Discharge summary*
**SECTION J. PRE-DRUG INTERVENTION**

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<th></th>
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<td></td>
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</tbody>
</table>

- [ ] **f/u of test results pending at time of discharge as applicable**
  - Insert or list if applicable.

- [ ] Additional tests that should be performed post-discharge, please list:
  - Insert or list.

---

**J10** Was the discharge summary completed by time of follow-up visit, so available to follow-up provider?

- [ ] YES
- [ ] NO
- [ ] Not Applicable

---

**SECTION K. POST DISCHARGE PERIOD**

**Kn 1** Was there a post-discharge phone call (contact made) to the patient?

- [ ] YES, answer Kn3
- [ ] No call
- [ ] N/A
  - Kn3: Select one
    - [ ] Call occurred within 72 hours
    - [ ] Call occurred in between 72 hours-7 days
    - [ ] Call occurred after more than 7 days
    - [ ] Call occurred in unknown time frame

**K17**: Check this box if true:
- [ ] Call occurred >72 hours post-discharge, or not at all, because of difficulty or inability to reach patient.

**K2**: If there was a post-discharge phone call, did the phone call consist of (check all)
that apply):

- [ ] Patient asked about any change in condition since discharge (breathing, cough)
- [ ] Patient asked about understanding of what the medications are for.
- [ ] Review of pending clinic appts and tests.
- [ ] Reinforcement of other discharge instructions, including recommended diet & what to do if symptoms worsen
- [ ] None of the above

Kn 4 Was there a post-discharge in-person visit (home visit) to the patient?

- [ ] YES, answer Kn7, K5, K6

Kn7. Select one:

- [ ] Visit occurred within 72 hours
- [ ] Visit occurred between 72 hours-7 days
- [ ] Visit occurred after more than 7 days
- [ ] Visit occurred in unknown time frame

- [ ] NO
- [ ] N/A

K5, K6

If a post-discharge home visit occurred, please indicate its content (use first visit).

K5: Who made the visit?

- [ ] VA provider
- [ ] Non-VA provider
- [ ] N/A

K6: Did the visit consist of: (check all that apply)?

- [ ] Patient asked about any change in condition since discharge (breathing, cough).
- [ ] Patient asked about understanding of what the medications are for.
- [ ] Review of pending clinic appts and tests.
- [ ] Reinforcement of other discharge instructions, including recommended diet & what to do if symptoms worsen.
- [ ] None of the above.

K8 Was there a post-discharge visit (or ER visit) with a provider (prior to the readmission)?

- [ ] YES, answer K9 and K10

K9: Was this a (check all that apply): ?

- [ ] Scheduled visit with PCP, or medical specialist.

Date of visit (1/1/9999) if unknown:

K10

Discharge plan/instructions
K16: If there was no scheduled visit with PCP, ID or pulmonary, indicate why. Check all that apply:

- The appointment was not scheduled by the discharge facility.
- The appointment was not scheduled by the patient.
- The patient missed the appointment.
- The patient was readmitted before the f/u appointment.
- Reason unclear.
- N/A.

K11: If there was a scheduled or unscheduled follow-up visit with the provider (PCP or medical specialist) that occurred prior to the date of readmission, were the following documented?

Check all that apply

- Patient’s current functional status
- Medications added, Answer K12
- Medications changed, Answer K12
- Medications discontinued, Answer K12

K12: Were meds added, changed, or discontinued without justification?

- YES, answer K13 and K14

K13: Which meds?

Type in here

K14: Explain:

Type in here

- NO
- N/A
- N/A
- Medications reconciled
### SECTION M. READMISSION

<table>
<thead>
<tr>
<th>M1</th>
<th>Was the patient readmitted through the Emergency Dept?</th>
<th>M2</th>
<th>Time of ED visit that led to readmission? (Military Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES, Answer M2</td>
<td></td>
<td>0000</td>
</tr>
<tr>
<td></td>
<td>NO, Answer M3</td>
<td></td>
<td>(if unavailable, enter N/A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M3</th>
<th>Where? (select one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct admission</td>
</tr>
<tr>
<td></td>
<td>Transferred from another acute care hospital</td>
</tr>
<tr>
<td></td>
<td>Transferred from a long-term care or residential facility</td>
</tr>
<tr>
<td></td>
<td>Other, Answer M4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M4</th>
<th>Specify.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Explain here</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>N/A</th>
</tr>
</thead>
</table>

### SECTION N. REASON FOR READMISSION (Adapted from Anderson’s Hospital Readmission Inventory)

<table>
<thead>
<tr>
<th>N1</th>
<th>In general, why was the patient readmitted to the hospital?</th>
<th>Check all that apply:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The primary diagnosis (pneumonia) got worse or there was a relapse of the primary diagnosis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One of the secondary diagnoses (other known medical conditions) got worse.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Specify:</th>
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</thead>
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<table>
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<tr>
<th></th>
<th>Explain here</th>
</tr>
</thead>
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<table>
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<tr>
<th></th>
<th>More space if needed</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A new problem developed.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Specify:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Explain here</th>
</tr>
</thead>
</table>

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<thead>
<tr>
<th></th>
<th>More space if needed</th>
</tr>
</thead>
</table>
Other:
- The patient was admitted for terminal care.
- The physician requested a hospital readmission.
- The patient was admitted with a PE or DVT (answer G2).

G2: ANSWER IF READMISSION WAS FOR DVT (N1):
Was pharmacological prophylaxis for venous thromboembolism, administered on admission?
Source: Admission note/history orders

- YES
- NO, answer G2e

G2e: Select one:
- Contraindicated
- Pt on full-dose anticoagulation
- Other, answer G3

G3: Specify.
Type in here

- Not Documented

Other, Answer N2
N2, specify.

Explain here

More space if needed

Table:

<table>
<thead>
<tr>
<th>N3</th>
<th>What were the specific circumstances surrounding the patient's readmission?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check all that apply: Symptoms</td>
</tr>
<tr>
<td></td>
<td>- The patient fell.</td>
</tr>
<tr>
<td></td>
<td>- Respiratory difficulties have developed or worsened.</td>
</tr>
<tr>
<td></td>
<td>- Cardiac symptoms have developed or worsened.</td>
</tr>
<tr>
<td></td>
<td>- GI symptoms have developed or worsened.</td>
</tr>
<tr>
<td></td>
<td>- Neurological symptoms have developed or worsened.</td>
</tr>
<tr>
<td></td>
<td>- Pain has developed or worsened.</td>
</tr>
<tr>
<td></td>
<td>- The patient has developed other symptoms, Answer N4</td>
</tr>
<tr>
<td></td>
<td>N4, Describe.</td>
</tr>
</tbody>
</table>

Explain here

More space if needed

History of Present Illness from:
Admission note
ED/UC note
Attending note
Signs

☐ The patient broke a bone.
☐ Bleeding has developed.
☐ The patient has developed a new infection, or worsening of an infection that was present during the prior admission.
☐ A wound has developed or worsened.
☐ The patient’s vital signs were abnormal.
☐ The patient’s lab values were abnormal.

Other

☐ The patient experienced problems with his/her medication.
☐ There were problems with medical equipment.
☐ The caregiver/family is no longer able to manage the patient at home.
☐ Other, Answer N5

N5, Specify.

Explain here

More space if needed

N6 The patient was readmitted for (primary diagnosis):

Check one:

☐ Same diagnosis, answer N7

N7, Explain.

Explain here

More space if needed

☐ Other diagnosis, answer Nn8, N10, N11 and N12

Nn8, Specify.

Explain here

More space if needed

N10: Was this problem active during the index admission (may or may not have been diagnosed but symptoms or signs were present?)

☐ Yes, answer N11

☐ No/unable to determine

Explain the answer to N10

Explain here

More space if needed

N11: If YES to N10, was this problem treated
N12. Was this problem a complication of treatment received during the index admission?

- Yes
- No/unable to determine

Explain the answer to N12

Explain here

More space if needed

SECTION P. ASSESSMENT OF PREVENTABILITY (Adapted from Oddone, JGIM 1996)

P1. According to the admission note (including attending note) which Patient Issues were noted at the time of readmission?

Check all that apply:

- The patient was not compliant with his/her medication regimen
- The patient was not compliant with his/her dietary regimen
- The patient was abusing alcohol/drugs post prior discharge
- The patient had an acute mental health issue (Dementia excluded)
- The patient lacked adequate home support or required more services than could be provided at home (e.g., nursing home or home health care)
- Other, Answer P2

P2, Explain.

Explain here

More space if needed

- None of the above

P3. According to the admission note (including attending note) which Provider/System Issues were noted at the time of readmission?

Check all that apply:

- The patient had a physician/provider assessment post-discharge but did not have a change in therapy despite worsening symptoms/signs
- The patient had a physician/provider assessment post-discharge but did not have a change in therapy despite abnormal laboratory tests
- Relevant information from index admission was not
communicated to the follow-up provider 
(communication could include mentioning in d/c summary)

☐ Recommendations for post-discharge follow-up or work-up of abnormal test results occurring during the index admission were inappropriate (from index admission discharge summary)

☐ The post-discharge provider did not follow through on “appropriate” discharge recommendations

☐ The provider did not document why he/she did not follow recommendations

☐ The patient or caregiver did not receive adequate discharge education (e.g. includes confirming understanding, f/u call)

☐ The admitting physician’s threshold for admission was inappropriately low

☐ Other, Answer P4

P4, Explain.

Explain here

More space if needed

☐ None of the above

P5 According to the admission note (including attending note) which *Either Patient or ProviderIssues* were noted at the time of readmission?

Check all that apply:

☐ The patient did not have physician/provider assessment (VA or non-VA) following discharge

☐ The patient did not receive prescribed medications (VA or non-VA)

☐ The patient had a medication side effect (from a drug started during the prior admission or post-discharge, includes medication interactions)

☐ The patient was an inappropriate full code or there was disagreement on code status; if YES, Answer P7.

P7, Explain.

Explain here

More space if needed

☐ The patient lacked advance care planning despite having advanced or end-stage disease

☐ Other, Answer P8

P8, Explain.
<table>
<thead>
<tr>
<th>P9</th>
<th>Do you feel this readmission was preventable? (See Guidelines)</th>
<th>Check the best response and explain why.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>☐ Preventable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ Possibly Preventable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ Un-preventable</td>
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</tbody>
</table>

P10. Explain (quote from physician’s notes, if possible):

<table>
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<tr>
<th>Explain here</th>
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<tbody>
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<td>More space if needed</td>
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P11
If there are special circumstances or comments related to this case that you feel are important that were not captured in the survey, please describe them. All special circumstances that involve clinical issues must be referred to physician for possible second review.

<table>
<thead>
<tr>
<th>Explain here</th>
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Widely used software doesn't pick up differences in care quality among hospital readmissions for pneumonia

Cases flagged by 3M as preventable received no worse care than unflagged cases, study shows

The 3M software program, increasingly used to make payments to US hospitals based on readmission rates, doesn't clearly distinguish differences in care quality—one of the key factors involved in readmission—between readmissions that are preventable and those that aren't, suggests research published online in BMJ Quality and Safety.

The Centers for Medicare and Medicaid Services (CMS) posts data on 30 day readmissions for three common causes of hospital admissions: heart attack; heart failure; and pneumonia.

Hospitals with high rates of readmissions are penalised financially and get less money from Medicare regardless of whether or not those readmissions could have been prevented.

In a bid to improve on the CMS measure and identify readmissions more likely to be preventable, 3M developed the Potentially Preventable Readmissions (PPRs) measure, which is now increasingly used by US state Medicaid programs for hospital payments.

3M identifies readmissions with diagnoses that are clinically related to those prompting the initial admission, to flag those patients whose readmission could have been avoided, and then generates hospital level rates of avoidable readmissions, taking account of population case mix and illness severity.

But it is not known to what extent these pairings reflect quality of care problems and which readmissions are therefore truly preventable.

The researchers therefore looked at whether readmissions flagged as PPRs by 3M were associated with poorer quality of care than those that weren’t in Veterans Health Administration patients admitted to hospital with pneumonia, and readmitted within 30 days, between 2006 and 2010.

They reviewed the medical records of 100 randomly selected cases out of more than 11,000, to look at the quality of care these patients had been given while in hospital and after discharge, using processes of care derived from evidence based data and a panel of clinical experts.

Somewhat surprisingly, the quality of care among the 77 cases flagged as PPRs was slightly better than the 23 unflagged cases (total average scores of 71.2 vs. 65.8 out of 100), although this difference was not statistically significant.

And there was also little information about the quality of care after discharge for flagged and unflagged cases.

Their findings lead the researchers to conclude that either PPR flagged cases are not more preventable, or that assessment of preventability requires other data collection methods to capture poorly documented processes.

In a linked editorial, Drs Christine Soong and Chaim Bell of Mount Sinai Hospital in Toronto, Canada, suggest that: "After years of intensive research to find an objective measure of preventable readmissions, it seems as imminent as the arrival of Godot."
And they suggest that perhaps it’s time to think differently about the issue. Readmission rates are too crude a measure and aren’t really patient centred, they suggest.

“The time has come to shift the focus of readmissions away from hospitals to a broader health systems approach,” they write. “Rather than focusing on readmissions, preventable or otherwise, time may be better spent in developing quality measures of complex disease management across a patient’s continuum of care,” they write.