



Medical scribes improve physician productivity in a Canadian emergency department

Journal:	<i>CMAJ Open</i>
Manuscript ID	CMAJOpen-2018-0031
Manuscript Type:	Descriptive
Date Submitted by the Author:	15-Feb-2018
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Keywords:	Community medicine, Emergency medicine, Family medicine, general practice, primary care, Health services research
More Detailed Keywords:	Wait times, Quality improvement, Productivity, Scribe, Outcomes
Abstract:	<p>Introduction: Emergency department (ED) efficiency has been a priority across Canada. In the United States, medical scribes can increase the number of patients seen per hour (PPH) per physician; however, it is not well known if these outcomes can be translated to Canada.</p> <p>Methods: We conducted a four-month quality improvement pilot study of medical scribes in the ED of a community hospital in Ottawa, Ontario. Eleven scribes were utilized ranging in age from 18 to 23 years old. Following scribe training, data collection began January 2015. Twenty-two full or part time emergency physicians were followed, who received shifts with and without a scribe over the next four months. Across the four months, the average PPH was determined for each physician during shifts with and without a scribe. Two-tailed paired-samples t-tests were used to compare mean (SD) PPH based on presence or absence of a scribe.</p> <p>Results: A total of 463 physician hours were documented without use of a scribe and 693.75 physician hours were documented with use of a scribe. Across all 22 physicians, 18 (81.8%) demonstrated a greater PPH with use of a scribe. Overall, PPH per physician was significantly greater (+12.9%) during shifts with a scribe (mean 2.81, SD 0.78) compared to shifts without a scribe (mean 2.49, SD 0.60) ($p=0.006$).</p> <p>Interpretation: Medical scribes resulted in an increased PPH per physician. As this was a small study at a single community centre, further research on the effects of scribes on ED performance in Canada is warranted.</p>

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*CMAJ Open***Medical scribes improve physician productivity in a Canadian emergency department**^{1,2,3,†}Peter S. Graves, M.D., CCFP(EM)³Stephen R. Graves, B.Sc.^{2,3}Tanvir Minhas, B.Sc.^{3,4}Rebecca E. Lewinson, B.Sc.⁵Isabelle A. Vallerand, Ph.D.⁵Ryan T. Lewinson, Ph.D.¹Department of Emergency Medicine, Queensway-Carleton Hospital, Ottawa, Ontario, Canada²Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada³Medical Scribes of Canada, Ottawa, Ontario, Canada⁴Faculty of Health, York University, Toronto, Ontario, Canada⁵Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada**†corresponding author**Peter Graves, Department of Emergency Medicine, Queensway-Carleton Hospital, 3045
Baseline Road, Ottawa, ON K2H 8P4, (613) 721-2000 ext 4710, pgraves@mediscribecanada.ca**Abstract word count: 248****Main text word count: 2020**

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3 32 **ABSTRACT**
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10 35 United States, medical scribes can increase the number of patients seen per hour (PPH) per
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41 49 **Interpretation:** Medical scribes resulted in an increased PPH per physician. As this was a small
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43 50 study at a single community centre, further research on the effects of scribes on ED performance
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45 51 in Canada is warranted.
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51 53 **Key Words:** Health systems; Outcomes; Productivity; Scribe; Wait times; Quality improvement
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54 INTRODUCTION

55 Improving emergency department (ED) efficiency and productivity has been a priority in
56 hospitals across Canada and there is a need for cost-effective, evidence-based solutions to
57 address this. In addition, electronic medical records (EMR) are becoming common, which have
58 the advantage of improving continuity of care through better documentation but also may have a
59 negative impact on productivity for some physicians.¹

60 Medical scribes provide real-time medical transcription of the physician-patient
61 encounter, flow management, and clerical support. The literature suggests that medical scribes
62 improve the physician-patient interaction, increase physician and ED productivity, and facilitate
63 better continuity of care due to a more accurate, complete, and legible medical record.^{2,3,4}
64 Overall, these benefits lead reduced hospital costs;⁵ however, these conclusions are largely based
65 on US data. Despite differences between the American and Canadian healthcare system, we
66 believe the benefits of having medical scribes may be transferable. Unfortunately, very limited
67 data exists on the use of medical scribes in Canadian emergency departments.

68 We sought to conduct a pilot project to assess the impact of introducing medical scribes
69 in a Canadian community hospital emergency department. The purpose of the study was to (a)
70 establish proof-of-concept of medical scribes in Canada and (b) gain experience in scribe
71 implementation so as to inform development of larger multicentre trials. Based on data from the
72 United States, it was hypothesized that using a medical scribe would be associated with greater
73 physician productivity.

77 **METHODS**

78 **Setting**

79 We conducted a four-month community-based quality improvement study of medical
80 scribes in the emergency department at the Queensway-Carleton Hospital (QCH) in Ottawa,
81 Ontario, Canada from January 2015 to April 2015. QCH is a non-academic community hospital
82 with approximately 30 full or part-time emergency physicians and about 70,000 annual
83 emergency room patient visits. Ethics approval for this study was obtained from the QCH. The
84 manuscript was prepared in accordance with the SQUIRE statement for quality improvement
85 studies.⁶

87 **Scribe Training and Implementation**

88 Scribes were supplied by Medical Scribes of Canada (Ottawa, ON). In total, 11 scribes
89 were utilized in the study ranging in age from 18 to 23 years old. As part of the Medical Scribes
90 of Canada model, each scribe was paid on an hourly basis through a grant from the QCH. To
91 recruit scribes, postings were made in the Ottawa-area for undergraduate students enrolled in
92 health-related bachelor's degree programs. Applicants were screened based on their academic
93 performance, work experience and volunteer experience, and then formally interviewed by
94 physicians and community members – similar to medical school admissions. As such, any
95 background and qualification differences across scribes were kept to a minimum.

96 Following hiring, all scribes underwent a basic training program in medical terminology
97 and disease presentations commonly encountered in the emergency department. From November
98 2014 to December 2014, scribes were introduced to the emergency department at the QCH
99 whereby scribes gained experience and confidence in charting and patient interaction, and

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3 100 physicians became comfortable with using a scribe. Essentially, medical scribes provide real-
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5 101 time medical transcription of the physician-patient encounter, flow management, and clerical
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7 102 support. Medical scribes are trained in medical terminology and confidentiality, and are held to
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9 103 the same standards of confidentiality as a physician or nurse. The scribes enter the room with the
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11 104 physician, and are present during the patient-physician encounter, after obtaining the patient's
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13 105 consent to have them present. During the encounter, the scribe documents the subjective history
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15 106 given by the patient, as well as results of the physical examination, which are verbally stated by
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17 107 the physician to the scribe. Following the encounter, the physician reads through the notes taken
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19 108 by the scribe to ensure that the relevant information is present, and that the information
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21 109 documented is correct, prior to signing off on the chart. Outside of the room, the scribe also helps
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23 110 manage the physician's flow by alerting them to patients that need to be reassessed, or when new
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25 111 test results have returned.
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33 113 **Intervention**

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35 114 Following scribe training and the initial two-month acclimation period for both scribes
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37 115 and physicians, data collection began January 2015. A convenience sample of twenty-two full or
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39 116 part time emergency physicians were followed in this study, who voluntarily participated to
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41 117 receive shifts with and without a scribe over the next four months. Scribe allocation to shifts was
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43 118 done by the Medical Scribes of Canada Human Resources Manager, who was blinded to all data
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45 119 collection, and based scheduling primarily on scribe availability since many had full-time
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47 120 undergraduate coursework schedules. As a consequence, scribes were only allocated to evening
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49 121 shifts. Effort was made to rotate scribes among physicians.
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3 122 At the QCH, the emergency department is divided into a cubicles area, an observation
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5 123 area and resuscitation bay. The cubicles area is used for more acute and localized cases such as
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7 124 fractures, lacerations, abscesses, acute abdominal pain, etc. The observation area is used for
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10 125 complex medical cases where the patient may be monitored for a long period such as altered
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12 126 level of consciousness, respiratory concerns or cardiac monitoring. The resuscitation bay is used
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15 127 for major trauma, procedural sedation and critical care. In this pilot study, scribes were only
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17 128 evaluated in the cubicles area as this tends to be where the QCH has the largest patient volumes.
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19 129 This also helped control for any bias that could arise if certain physicians spent more of their
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22 130 shifts in the lower volume observation area.

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24 131 As we sought to evaluate the real-world implementation of scribes, who were also on
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26 132 contract for a certain number of hours per week, there were more shifts with scribes than without
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28 133 scribes, but we ensured that each participating physician experienced shifts with and without
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30 134 scribes during the four month study. Any shifts with or without scribes that were reported to be
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33 135 of low patient volume were removed from analysis. Low patient volume was defined based on
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35 136 having in excess of 1 hour without new patients to see.
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39 40 138 **Physician Performance Data and Analysis**

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42 139 Hospital records were utilized to extract physician work hours as well as the number of
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44 140 patients seen by each physician on each shift. From these metrics, patients per hour (PPH) per
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46 141 physician was calculated for each shift. Across the four months, the average PPH was
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49 142 determined for each physician during shifts with a scribe and shifts without a scribe.

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51 143 Stata v14.2 I/C (StataCorp, College Station, TX) was used to assess data statistically,
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54 144 with a significance level of 0.05. All analyses were performed by two blinded researchers. Two-

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3 145 tailed paired-samples t-tests were used to compare PPH metrics within physicians based on
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5 146 presence or absence of a scribe. To ascertain whether PPH metrics during non-scribe shifts were
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7 147 biased due to ongoing scribe use during the four month period, a sensitivity analysis was
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9 148 conducted on available hospital data from January 2014 to April 2014, where no scribes were
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11 149 used. Here, PPH metrics of 18 of the 22 physicians in the study were available, and these values
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13 150 were compared to the 2015 PPH metrics on shifts without a scribe using a two-tailed paired-
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15 151 samples t-test.
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21 153 **RESULTS**

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24 154 Twenty-two emergency physicians volunteered to participate in this community-based
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26 155 study, having shifts both with and without a scribe over the four month period. Demographic
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28 156 details of the physicians in this study are shown in Table 1. Across the four month study period,
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30 157 a total of 463.0 physician hours were documented without use of a scribe and 693.75 physician
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32 158 hours were documented with use of a scribe.
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35 159 Across all 22 physicians in the study, 18 (81.8%) demonstrated a greater PPH with use of
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37 160 a scribe. Use of a scribe was associated with a significantly greater PPH per physician ($p=0.006$,
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39 161 mean increase of 12.9%, range of -41% to +118%), with the mean PPH per physician over the
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41 162 four month study period being 2.81 (SD 0.78) with a scribe and 2.49 (SD 0.60) without a scribe
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43 163 (Figure 1).
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47 164 PPH metrics were determined for 18 of the 22 physicians captured in the 2015 data for
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49 165 use in the sensitivity analysis. Here, it was found that PPH per physician metrics from no-scribe
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51 166 shifts did not differ between 2014 (mean 2.43, SD 0.43) and 2015 (mean 2.53, SD 0.47)
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53 167 ($p=0.315$).
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169 **DISCUSSION**

170 This study was performed to assess the effects of medical scribes on physician
171 productivity in a Canadian community-hospital ED. Results demonstrated that physician
172 productivity was significantly higher with use of a scribe compared to shifts without a scribe,
173 which is in agreement with U.S. data on scribes. While caution must be taken in extrapolating
174 these findings to other Canadian centres, the results are promising and suggest a need for further
175 study in this area, as they have the potential to improve health care efficiency.

176 In the United States, it has been shown that the use of scribes contributes to increased
177 number of patients seen per hour,³ improved physician and patient satisfaction,² and increasing
178 time spent in patient interaction while decreasing time reporting.⁷ Furthermore, productivity
179 measures appear to be maintained at least up to one year following scribe implementation.⁸ In
180 contrast to these findings, a Canadian study that was presented at the 2012 Canadian Academy of
181 Emergency Medicine meeting did not find a significant increase in patients seen per hour with a
182 scribe,⁹ although improved physician-nurse satisfaction and improved chart legibility was
183 reported. This study took place in an academic hospital and did not describe if a pre-study
184 training period was given to scribes. These factors may affect overall efficiency as understanding
185 of content and documentation procedures may be critical to scribe performance. Moreover, it is
186 possible that efficiency at large academic centres may be less affected by scribes due to the
187 tendency for more urgent or severe cases being seen, which may occupy more resources,¹⁰ or
188 may have more medical residents on service who may not be as efficient as senior staff.

189 On average, an emergency physician in Canada earns approximately \$150 per hour,
190 meaning their revenue is approximately \$1200 per shift without a scribe. At the hourly wage

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3 191 used in the present study, a scribe would cost the physician \$216 per shift. Given a scribe may be
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5 192 associated with an increase of ~13% in productivity, the “cost” to the physician using a scribe
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7 193 would be about \$60 relative to what their earnings would be without a scribe. This may be
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10 194 dependent upon the type of billing shift the physician is scheduled to, and the volume in the
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12 195 emergency department. From a systems perspective, this also means that emergency physicians
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14 196 would bill at a greater amount per shift due to increased volume of patient care. Further research
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17 197 is needed to understand the full cost-benefit implications of scribes.
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19 198 This study has limitations that should be considered. Firstly, this was a relatively small
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21 199 study with short follow-up time at a single community-hospital, and while results suggested
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23 200 improved physician productivity, longer-term studies at multiple centres with more physicians
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25 201 are needed to assess the generalizability of these results. Moreover, with larger studies,
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27 202 additional covariates may be assessed to further understand factors contributing to increased
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29 203 productivity with scribes such as patient clinical presentations, emergency severity index, and
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31 204 scribe experience. Another limitation is that the present study only evaluated physician
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33 205 productivity as an outcome, primarily to gain proof-of-concept in Canada with our method of
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35 206 scribe implementation and training. In future studies, other variables such as physician and
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37 207 patient satisfaction, and health-related outcomes should be considered. Anecdotally, about 40%
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39 208 of the physicians who participated in this study have begun to pay out-of-pocket for scribe
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41 209 services on an ongoing basis, citing increased job satisfaction, increased quality of the patient-
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43 210 physician encounter, as well as more accurate and detailed documentation as reasons for the
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45 211 expense. Currently, we have expanded the scribe program to other centres and clinical settings
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47 212 (e.g. outpatient clinics, surgical clinics) for further evaluation in longer-term studies and to more
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3 213 formally assess physician and patient satisfaction, and also investigate other markers of health
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5 214 care efficiency such as patient wait times.
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8 215 In conclusion, this quality improvement pilot study of medical scribes in a Canadian
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10 216 community-hospital ED provides proof-of-concept that scribes can increase physician
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12 217 productivity. These results suggest that the benefits of scribes may be achieved in a Canadian
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14 218 centre, and that there is a need for further research on this topic to more broadly assess the
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16 219 effects of scribes on ED performance, and physician-patient interactions in Canada.
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3 221 **Funding:** Queensway-Carleton Hospital (QCH) Research Grant, National Research Council of
4
5 222 Canada (NRC) IRAP. The QCH and NRC had no role in conducting the study, analyzing the
6
7 223 data or drafting the results.
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11
12 225 **Conflicts of interest:** PSG and SRG are owners of Medical Scribes of Canada. TM and REL
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14 226 were employees of Medical Scribes of Canada at the time of the study. PSG, SRG and TM report
15
16 227 funding from NRC IRAP. PSG and SRG report funding from the Queensway-Carleton Hospital.
17
18 228 IAV and RTL have no conflicts of interest.
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22
23 230 **Author contributions:** PSG and SRG conceived and designed the study. TM and REL acquired
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25 231 all data for the study. IAV and RTL analyzed all data for the study and drafted the manuscript.
26
27 232 PSG, SRG, TM and REL provided critical input to the manuscript for revision. All authors
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29 233 approved the final version of this manuscript.
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272 **FIGURE CAPTIONS**

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274 **Figure 1. Physician efficiency without a scribe vs. with a scribe.** These data represent mean
275 values across all 22 physicians during the four-month study.

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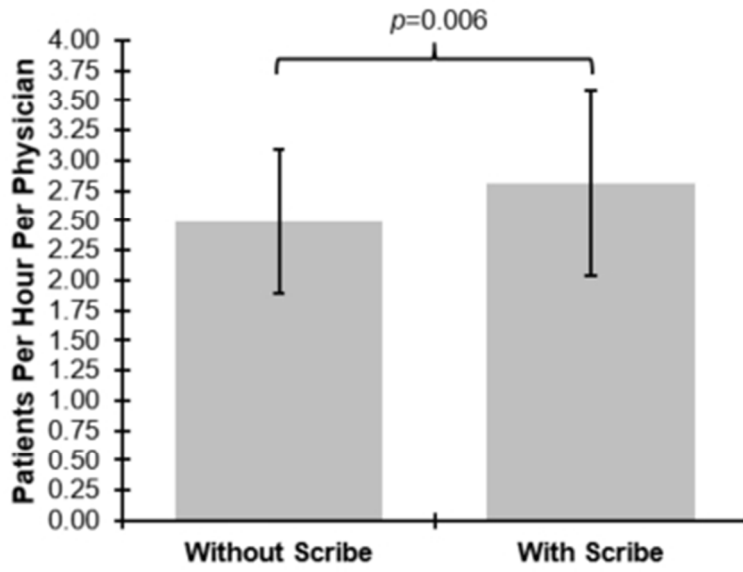


Figure 1

102x77mm (96 x 96 DPI)

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3 **1 TABLES**4
5 **2**6
7 **3 Table 1. Physician characteristics.** Data shows the demographic and clinical characteristics of
8
9 **4** the physicians participating in the study.

Variable	Value	5
Sex		6
<i>Number of males</i>	12 (55%)	7
<i>Number of females</i>	10 (45%)	8
Job Type		9
<i>Number of full-time physicians</i>	9 (41%)	10
<i>Number of part-time physicians</i>	13 (59%)	11
Training		12
<i>Mean years with independent licence to practice (S.D.)</i>	11.0 (10.1)	

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Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)
September 15, 2015

Text Section and Item Name	Section or Item Description
Notes to authors	<ul style="list-style-type: none"> • The SQUIRE guidelines provide a framework for reporting new knowledge about how to improve healthcare • The SQUIRE guidelines are intended for reports that describe system level work to improve the quality, safety, and value of healthcare, and used methods to establish that observed outcomes were due to the intervention(s). • A range of approaches exists for improving healthcare. SQUIRE may be adapted for reporting any of these. • Authors should consider every SQUIRE item, but it may be inappropriate or unnecessary to include every SQUIRE element in a particular manuscript. • The SQUIRE Glossary contains definitions of many of the key words in SQUIRE. • The Explanation and Elaboration document provides specific examples of well-written SQUIRE items, and an in-depth explanation of each item. • Please cite SQUIRE when it is used to write a manuscript.
Title and Abstract	
Title page	<p>1. Title Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare)</p>
Abstract	<p>2. Abstract</p> <p>a. Provide adequate information to aid in searching and indexing</p> <p>b. Summarize all key information from various sections of the text using the abstract format of the intended publication or a structured summary such as: background, local problem, methods, interventions, results, conclusions</p>
Page 3	<p>Introduction <i>Why did you start?</i></p> <p>3. Problem Description Nature and significance of the local problem</p>
Page 3	<p>4. Available knowledge Summary of what is currently known about the problem, including relevant previous studies</p>

Page 3	5. <u>Rationale</u>	Informal or formal frameworks, models, concepts, and/or <u>theories</u> used to explain the <u>problem</u> , any reasons or <u>assumptions</u> that were used to develop the <u>intervention(s)</u> , and reasons why the <u>intervention(s)</u> was expected to work
Page 3	6. Specific aims	Purpose of the project and of this report
	Methods	<i>What did you do?</i>
Page 4-6	7. <u>Context</u>	Contextual elements considered important at the outset of introducing the <u>intervention(s)</u>
Page 4-6	8. <u>Intervention(s)</u>	a. Description of the <u>intervention(s)</u> in sufficient detail that others could reproduce it b. Specifics of the team involved in the work
Page 6-7	9. Study of the Intervention(s)	a. Approach chosen for assessing the impact of the <u>intervention(s)</u> b. Approach used to establish whether the observed outcomes were due to the <u>intervention(s)</u>
Page 6-7	10. Measures	a. Measures chosen for studying <u>processes</u> and outcomes of the <u>intervention(s)</u> , including rationale for choosing them, their operational definitions, and their validity and reliability b. Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost c. Methods employed for assessing completeness and accuracy of data
Page 6-7	11. Analysis	a. Qualitative and quantitative methods used to draw <u>inferences</u> from the data b. Methods for understanding variation within the data, including the effects of time as a variable
Page 4-7	12. Ethical Considerations	<u>Ethical aspects</u> of implementing and studying the <u>intervention(s)</u> and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest
	Results	<i>What did you find?</i>
Page 7	13. Results	a. Initial steps of the <u>intervention(s)</u> and their evolution over time (e.g., time-line diagram, flow chart, or table), including modifications made to the intervention during the project b. Details of the <u>process</u> measures and outcome c. Contextual elements that interacted with the <u>intervention(s)</u> d. Observed associations between outcomes, interventions, and relevant contextual elements e. Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the <u>intervention(s)</u> . f. Details about missing data
	Discussion	<i>What does it mean?</i>
Page 8-10	14. Summary	a. Key findings, including relevance to the <u>rationale</u> and specific aims b. Particular strengths of the project

Page 8-10	15. Interpretation	<ul style="list-style-type: none"> a. Nature of the association between the intervention(s) and the outcomes b. Comparison of results with findings from other publications c. Impact of the project on people and systems d. Reasons for any differences between observed and anticipated outcomes, including the influence of context e. Costs and strategic trade-offs, including opportunity costs
Page 8-10	16. Limitations	<ul style="list-style-type: none"> a. Limits to the generalizability of the work b. Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis c. Efforts made to minimize and adjust for limitations
Page 8-10	17. Conclusions	<ul style="list-style-type: none"> a. Usefulness of the work b. Sustainability c. Potential for spread to other contexts d. Implications for practice and for further study in the field e. Suggested next steps
	Other information	
Page 11	18. Funding	Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting

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