Is early treatment of acute chest pain provided sooner to patients who speak the national language?

MARCO SANTOS1, ANNICA RAVN-FISCHER2, THOMAS KARLSSON2, JOHAN HERLITZ3 AND BO BERGMAN1

1Division of Quality Sciences/Centre for Healthcare Improvement, Chalmers University of Technology, Gothenburg, Sweden, 2Institution of Medicine, Department of Molecular and Clinical Medicine, Sahlgrenska University Hospital, Gothenburg, Sweden and 3The Centre of Prehospital Research in Western Sweden, University of Borås and Sahlgrenska University Hospital, Gothenburg, Sweden

Address reprint requests to: Marco Santos, Division of Quality Sciences/Centre for Healthcare Improvement, Chalmers University of Technology, SE-412 96 Göteborg, Sweden; E-mail: marco.santos@chalmers.se

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Abstract

Objective. Identify differences in the early treatment of acute chest pain patients with regard to the language proficiency of patients and thus identify opportunities for improving equity in cardiac care.

Design. Retrospective cross-sectional study comparing care delivered to Swedish-speaking (SS) and non-Swedish-speaking (NSS) patients.

Setting. A Swedish university hospital that provides highly specialized care to 1.6 million inhabitants.

Participants. All patients with acute chest pain or symptoms suggestive of acute coronary syndrome who sought care between mid-September and mid-December 2008 (2588 visits). Missing data on the patient group to which study subjects belonged were 2% (45 visits). NSS represented 8% of the 2543 visits ($N_{SS}$ = 2334; $N_{NSS}$ = 209).

Main Outcome Measure(s). Delay times from arrival in hospital to admission to catheterization laboratory or ward ($\Delta T_{HOSP-PCI}$), first physical contact to first electrocardiogram ($\Delta T_{CONTACT-ECG}$), first physical contact to first aspirin ($\Delta T_{CONTACT-ASA}$) and arrival in hospital to coronary angiography ($\Delta T_{HOSP-ANGIO}$). Also included baseline characteristics of patients, diagnosis and findings in hospital and secondary preventive activities.

Results. The median $\Delta T_{HOSP-PCI}$ was longer for NSS by 43 min [254 versus 211, 95% confidence interval (CI), odds ratio (OR) = (1.3; 2.8)]. The median $\Delta T_{CONTACT-ECG}$ and $\Delta T_{HOSP-ANGIO}$ were longer for NSS by 4 min [17 versus 13, 95% CI, OR = (0.8; 1.8)] and 14 h [44 versus 30, 95% CI, OR = (0.6; 3.6)], respectively. Conversely, the median $\Delta T_{CONTACT-ASA}$ was longer for SS by 20 min [81 versus 61, 95% CI, OR = (0.3; 1.6)].

Conclusions. Poorer language proficiency was associated with longer delay time from arrival in hospital to admission to catheterization laboratory or ward. No other delay times were found to be statistically significantly different with respect to the language proficiency of patients.

Keywords: acute coronary syndrome, quality of health care, socioeconomic factors, communication barriers, interpreter services

Introduction

Increasing demographic diversification and awareness of the existence of inequalities in health and health care [1] have propelled the movement for cultural competence in medicine [2–5] and the elevation of patient-centredness and equity as essential dimensions of the quality of health care [6]. Over more recent years, inequalities seem to persist and their causes remain poorly understood [7].

One of the aspects associated with multiethnic societies is the emergence of a gradient in proficiency in a society’s official language(s) and subsequent challenges in healthcare delivery [8]. Language barriers have been found to be associated with disparate healthcare delivery and poorer outcomes [9, 10]. More specifically, patients with limited language proficiency have been found to have ‘less access to a usual source of care, and lower rates of physician visits and preventive services’ [10]. Even when these patients have access to care, they often
have ‘poorer adherence to treatment and follow-up for chronic illnesses, decreased comprehension of their diagnoses and treatment after emergency department visits, decreased satisfaction with care and increased medication complications’ [10]. These patients also have more tests done at a higher overall cost, higher risk of hospitalization and higher risk of being discharged from the emergency department without a follow-up appointment [11]. Furthermore, they often experience delays in treatment initiation, management and discharge from the hospital, and they are unable to give a true informed consent [11]. Language proficiency, like skin color, can be used as a social marker to classify, categorize and negatively evaluate patients with foreign backgrounds [12].

The provision of interpreter services by professional interpreters or bilingual staff is one of the possible strategies for promoting cultural competence and circumventing language barriers [13–15], although the interpreter competency of bilingual staff often remains unverified [16]. Overall, the quality of interpreter services seems nevertheless be halting which poses enhanced risks for patients [11, 17, 18]. Concerns about the quality of interpreter services have also been raised in Sweden, where <15% of the estimated 6000 interpreters available have formal authorization and <2% have special competence in healthcare interpreting [19, 20]. This subject is of utmost importance as differences in mortality and morbidity have been found between immigrants and native Swedes, especially concerning coronary heart diseases [21–28]. The perceptions of healthcare providers and patients of using interpreter services are to large extent ambivalent and vary greatly, both in Sweden [19, 29, 30] and abroad [31].

Cardiac care is one of the areas in which racial and ethnic discrimination has been found [32, 33] and it is, moreover, of vital importance as cardiovascular diseases, e.g. acute myocardial infarction (AMI), remain a major cause of death worldwide [34]. In Sweden, the incidence of AMI in 2008 was 619 per 100 000 individuals per year for men and 440 per 100 000 per year for women [35]. In 2008, the 28-day mortality rate for AMI in Sweden was 29% among men and 32% among women [35]. Guidelines for the treatment of AMI in Sweden [36] are revised by the Swedish National Board of Health and Welfare and made available to healthcare providers.

The effects of language barriers on the cardiac care received by patients in general, and patients with AMI in particular, remain scarcely explored in Sweden. Thus, the objective of this study was to investigate the differences in delivered care to patients with acute chest pain with regard to language proficiency in Swedish, thus pinpointing future opportunities for improvement that may enhance equitable access to cardiac care among inhabitants of the same community. This study focuses on delay times to treatments and investigations, which are critical variables in the treatment of a life-threatening condition such as acute chest pain.

**Methods**

Sahlgrenska University Hospital is one of seven university hospitals offering medical education in Sweden. The hospital provides emergency and basic care to the ∼630 000 inhabitants of the Gothenburg region. It also provides highly specialized care for 1.6 million inhabitants of western Sweden [37]. The Sahlgrenska University Hospital is located in the Västra Götaland (West Sweden) region in which 15% of its 1.6 million inhabitants is born abroad (data concerning 2011) [38] and speak ∼150 different languages. In 2006, >23 000 h of interpretation was provided in 93 languages to 581 patients, including the university hospital, local hospitals and primary care clinics [39]. Representing ∼67% of interpreter service time provision, the most common languages were Arabic, Serbo-Croatian, Kurdish, Persian and Somali [39]. Service provision by professional interpreters in the region seems nevertheless to be insufficient as only 25% of patients enjoy access to a professional interpreter in their contacts with radiology staff [19].

Data concerning one-fourth of the annual population of patients with acute chest pain or symptoms suggestive of acute coronary syndrome were collected retrospectively using an abstraction form. The patients included in the study sought care between mid-September and mid-December 2008 for a total of 2588 visits. Data were collected from ambulance records, medical records, an electrocardiography database, an echocardiography database and a laboratory database. The study included the delay times from arrival in hospital to admission to catheterization laboratory or ward (ΔT(HOSP-PCL)), first physical contact to first electrocardiogram (ΔT(CONTACT-ECG)), first physical contact to first aspirin (ΔT(CONTACT-ASA)) and from arrival in hospital to coronary angiography (ΔT(HOSP-ANGIO)). Subordinate to the delay times, this study also included baseline characteristics of patients, diagnosis and findings in hospital and secondary preventive activities. The abstraction form used for data collection was developed by the second and third co-authors of this paper jointly with a group of nine practicing nurses who would later collect the empirical data from the different databases. The abstraction form developed was pilot tested and thereafter revised. Besides participation of the data collectors in the development of the abstraction form, uniformity in data collection was also enabled by holding regular meetings within the development group. Formal assessment of inter-data collector validity was thus deemed unnecessary.

The grouping variable used in this study, i.e. ‘need for interpreter’, was collected for each patient and coded ‘Yes’ or ‘No’. Two groups of patients were thus created: ‘Swedish-speaking’ (SS), for those cases in which there were no need for interpreter services and ‘non-Swedish-speaking’ (NSS), for the remainder. Despite the risks inherent in retrospective studies of distorting effects of excessive missing data, only in 45 (2%) of the 2588 visits there was no indication about a need for interpreter. As these visits did not seem to represent outlier cases, they were deleted from the analyses outright. Subsequent results are thus based on 2543 visits made by 2339 patients of which 1338 (53%) visits resulted in hospitalization. An interpreter service was deemed necessary in 209 (8%) visits. The need for interpreter service was affected by both the perceptions of patients and healthcare providers. In some cases, the patients themselves exerted their legal right to request
interpreter service, whereas in other cases, the request stemmed from healthcare providers who experienced difficulties in communicating with the patient in Swedish. The cases in which interpreting was done by a patient’s relative or a bilingual healthcare provider were also included in the NSS group. The quality of the data collected depended on the quality of the data existing in databases and records used in this study. No assessment of the quality of the latter data was made in this study.

Statistical analysis

The Mann–Whitney U-test was used to test for the difference in age between SS and NSS. All other P-values are age adjusted using the Cochran–Mantel–Haenszel statistic for proportions and a stratum-adjusted Kruskall–Wallis test for continuous/ordered variables. Concerning the delay times examined in this study (Table 2), that from the time of arrival in hospital to admission to catheterization laboratory or ward, was considered the primary outcome of the study, whereas the remaining delay times were considered secondary outcomes. The delay times were adjusted using multiple logistic regression with delay time dichotomized by the median as a dependent variable, for all baseline characteristics, i.e. all variables in Table 1, with a univariate P < 0.20 for association both with group belonging, i.e. NSS or SS, and with the delay time in question. All tests were two-sided and statistical significance was set at the 0.05 probability level.

Results

The language(s) and nationality or origin of the patient were recorded in 174 (83%) of the 209 NSS. The six most frequent languages covered more than two-thirds of the NSS. These languages were Bosnian/Croatian/Serbian (17%), Arabic (13%), Persian (13%), Kurdish (11%), Somali (7%) and Turkish (6%). In comparison with SS, the NSS were younger, especially concerning hospitalized patients (Table 1). No statistically significant difference was found between SS and NSS concerning gender, although there was a greater percentage of females among NSS than among SS (Table 1). For several

| Table 1  | Baseline characteristics in all patients and in patients who were hospitalized |
|-----------------|-------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
|               | All patients                                   |                |               | Hospitalized patients |                |
|               | Swedish speaking (n = 2334)                     | Non-Swedish speaking (n = 209) | P<sup>a</sup> | Swedish speaking (n = 1210) | Non-Swedish speaking (n = 128) | P<sup>a</sup> |
| Age, years (mean ± SD) | 60 ± 19                                         | 58 ± 16        | 0.03          | 67 ± 16                                         | 63 ± 14        | <0.001          |
| Females (%)     | 48                                              | 51             | 0.23          | 46                                              | 48             | 0.50            |
| Previous history (%) |                                               |                |               |                                               |                |
| Diabetes        | 13<sup>b</sup>                                  | 22<sup>c</sup> | <0.001        | 16                                              | 29<sup>b</sup> | <0.001          |
| Hypertension    | 35<sup>b</sup>                                  | 41<sup>c</sup> | 0.01          | 43                                              | 43<sup>b</sup> | 0.34            |
| Heart failure   | 10<sup>b</sup>                                  | 9<sup>c</sup>  | 0.32          | 14                                              | 13<sup>b</sup> | 0.40            |
| Myocardial infarction | 21<sup>b</sup>                                   | 26<sup>c</sup> | 0.01          | 30                                              | 34             | 0.13            |
| Angina pectoris | 22<sup>b</sup>                                  | 22<sup>c</sup> | 0.33          | 32                                              | 29<sup>b</sup> | 0.97            |
| PCI             | 11<sup>b</sup>                                  | 17<sup>b</sup> | 0.03          | 16                                              | 22             | 0.21            |
| Coronary artery bypass grafting | 8<sup>b</sup>                                   | 9<sup>b</sup>  | 0.48          | 12                                              | 12             | 0.95            |
| Stroke          | 7<sup>b</sup>                                   | 11<sup>b</sup> | 0.002         | 10                                              | 15             | 0.008           |
| Peripheral vascular disease | 2<sup>b</sup>                                    | <1<sup>b</sup> | 0.31          | 3                                               | 0              | 0.09            |
| Depression/psychiatric disease | 12<sup>b</sup>                                  | 14<sup>c</sup> | 0.53          | 13                                              | 17<sup>b</sup> | 0.29            |
| Admitted to hospital via (%) |                                              |                |               |                                               |                |
| Emergency department | 96                                             | 94             | 0.41          | 96                                              | 96             | 0.85            |
| Directly to cardiac care unit | 2                                              | 2              | 0.55          | 4                                               | 4              | 0.85            |
| Already hospitalized<sup>d</sup> | 3                                              | 3              | 0.57          | —                                               | —              | —               |
| Transported by ambulance (%) | 40                                             | 41             | 0.19          | 52                                              | 50             | 0.62            |
| Hospitalized (%) | 54                                             | 64             | <0.001        | —                                               | —              | —               |
| ECG (%)          |                                               |                |               |                                               |                |
| ST changes       | 6.3                                            | 4.1<sup>b</sup> | 0.28          | 9.1                                             | 6.3            | 0.43            |
| ST elevation     | 3.2                                            | 3.0<sup>b</sup> | 0.54          | 4.0                                             | 4.7            | 0.91            |
| ST depression    | 3.9                                            | 1.5<sup>b</sup> | 0.17          | 6.3                                             | 2.4            | 0.16            |

<sup>a</sup>Age adjusted (except for age).
<sup>b</sup>5–10% missing.
<sup>c</sup>10–25% missing.
<sup>d</sup>Including those transferred from another hospital, family doctor, nursing home etc.
diseases, there were statistically significant differences in previous history between NSS and SS (Table 1). Thus, NSS had a previous history of diabetes, hypertension, myocardial infarction, percutaneous coronary intervention (PCI) and stroke more often than SS patients. The preponderance of these diseases among NSS patients remains even when restricting the analysis to hospitalized patients. However, only the differences concerning a previous history of diabetes and stroke achieve statistical significance.

The main variables examined in this study are shown in Tables 2 and 3. These consisted of four delay times which were recorded for all hospitalized patients. No statistically significant differences were found between NSS and SS when adjusting exclusively for age. However, when adjusting for differences in other baseline characteristics, e.g. previous history of diabetes, it was found that median \( \Delta T_{HOSP-PCI} \) was statistically significantly longer for NSS by 43 min [254 versus 211, 95\% confidence interval (CI), odds ratio (OR) = 1.3; 2.8]. Differences in the remaining delay times lacked statistical significance.

Concerning the possible channels for admission to hospital, the overwhelming majority of patients was admitted to hospital via the emergency department (Table 1). No statistically significant differences were found between NSS and SS in the proportion of patients admitted to hospital via the different channels. Neither was there a difference between NSS and SS in the proportion of patients transported to hospital by ambulance. Nearly 40\% of all patients were transported to hospital via ambulance, a proportion that rises to 52\% when considering only hospitalized patients. The rate of hospitalization differed greatly between NSS and SS (Table 1). Thus, 54\% of the SS patients admitted to hospital were hospitalized, whereas hospitalization occurred in 64\% of the NSS patients \( (P < 0.001) \).

As seen in Table 4, no statistically significant differences were found between hospitalized SS and NSS patients concerning final diagnosis regardless of the diagnosis position. Nor were there statistically significant differences in coronary angiographic and echocardiographic findings. The rates of performance of coronary angiography (18\%) and echocardiography (31\%) were similar for the two groups.

Concerning secondary preventive activities, no statistically significant difference was found between the two groups in the proportion of hospitalized patients undergoing lipid analysis within 24 h after onset of symptoms. This proportion was larger for SS patients, who underwent lipid analysis in nearly half of the cases. About 1 in 20 of all hospitalized patients died during the hospitalization, a proportion that was similar among both SS and NSS.

**Discussion**

Language barriers seem to have a detrimental effect on \( \Delta T_{HOSP-PCI} \) (4 h 14 min versus 3 h 31 min). This 43-min delay requires further examination, although it is plausible that the delay results from greater difficulties in the communication between healthcare providers and NSS patients at the time that data on patient symptoms and history of disease are collected. Concerning the remaining time delays, no statistically significant differences were found between NSS and SS. The lack of statistical significance in the difference between the median \( \Delta T_{CONTACT-ECG} \) between NSS and SS (17 versus 13 min) offers no surprise as the performance of electrocardiograms in patients requires almost no communication between the healthcare providers and patients. With respect to the 20-min prolonged delay in \( \Delta T_{CONTACT-ASA} \) for SS (81 versus 61 min), there seems to be no immediate explanation for the difference and it may indeed be due to randomness. Likewise, it cannot be excluded that the 14-h difference in \( \Delta T_{HOSP-ANGIO} \).

### Table 2

All hospitalized patients; median (10th percentile–90th percentile), minutes; OR and corresponding 95\% CI for NSS in relation to SS having a delay above median.

<table>
<thead>
<tr>
<th>Delay variable (Table 3)</th>
<th>Swedish speaking</th>
<th>Non-Swedish speaking</th>
<th>( P )</th>
<th>OR(^b) (95% CI)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival in hospital to admission:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI laboratory or ward (median 216)</td>
<td>211 (78–518)</td>
<td>254 (76–513)</td>
<td>0.06</td>
<td>1.89 (1.27–2.82)</td>
<td>0.002</td>
</tr>
<tr>
<td>( n = 1155 )</td>
<td>( n = 123 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st physical contact to 1st ECG (median 13)</td>
<td>13 (0–76)(^c)</td>
<td>17 (0–81)(^d)</td>
<td>0.17</td>
<td>1.18 (0.78–1.78)</td>
<td>0.43</td>
</tr>
<tr>
<td>( n = 1073 )</td>
<td>( n = 119 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First physical contact to first aspirin (median 78)</td>
<td>81 (5–1249)(^d)</td>
<td>61 (4–1309)(^d)</td>
<td>0.91</td>
<td>0.73 (0.34–1.58)</td>
<td>0.43</td>
</tr>
<tr>
<td>( n = 286 )</td>
<td>( n = 34 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrival in hospital to coronary angiography (median 1819)</td>
<td>1806 (24–7898)(^d)</td>
<td>2631 (28–8614)(^c)</td>
<td>0.84</td>
<td>1.43 (0.57–3.63)</td>
<td>0.45</td>
</tr>
<tr>
<td>( n = 202 )</td>
<td>( n = 21 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Baseline variables used: for arrival in hospital to arrival in PCI laboratory/ward: age, previous PCI and ST-depression; for first physical contact to first ECG: age, previous diabetes, previous stroke, previous peripheral vascular disease and ST depression; for first physical contact to aspirin: age, previous diabetes, previous PCI and previous stroke; for arrival in hospital to coronary angiography: previous PCI and previous peripheral vascular disease.

\(^a\)Age adjusted.

\(^b\)Adjusted for all baseline variables with univariate \( P > 0.20 \) for association with group belonging and delay.

\(^c\)5–10\% missing.

\(^d\)10–25\% missing.
between NSS and SS (44 versus 30 h) results merely from chance and that the median $\Delta T_{HOSP-ANGIO}$ are indeed similar for NSS and SS populations. However, the doubts on the etiology of identified differences persist however as scant guidance is provided by previous studies.

In this study, the NSS patients had a higher prevalence of various previous diseases, namely diabetes (22 versus 13%) and stroke (11 versus 7%). This suggests that the NSS patients have a higher risk of coronary heart disease and that additional primary preventive actions should be targeted at this group. This finding is in agreement with a previous study according to which ‘foreign-born people possess an overrisk of cardiovascular or coronary heart disease compared with Swedish-born persons’ [21] and tailored primary care for NSS patients is necessary [23]. Concerning the rate of use of ambulances, it has been found in previous research that ambulance transport is associated with shorter time delays to initiation of investigations and therapies [40]. In this regard, the similarity between the two groups can be seen as a positive sign of equality in the treatment of patients with acute chest pain.

### Table 3  Proportion of hospitalized patients eligible for calculation of the various delay variables

<table>
<thead>
<tr>
<th></th>
<th>Swedish speaking ($n = 1210$), %</th>
<th>Non-Swedish speaking ($n = 128$), %</th>
<th>$P^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted to PCI laboratory or ward</td>
<td>100</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>ECG performed</td>
<td>100</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>Aspirin administered</td>
<td>27</td>
<td>29</td>
<td>0.70</td>
</tr>
<tr>
<td>Coronary angiography performed</td>
<td>18</td>
<td>18</td>
<td>0.61</td>
</tr>
</tbody>
</table>

$a$Age adjusted.

### Table 4  Diagnosis and findings in hospital and secondary preventive activities

<table>
<thead>
<tr>
<th></th>
<th>All hospitalized patients</th>
<th>Swedish speaking ($n = 1210$), %</th>
<th>Non-Swedish speaking ($n = 128$), %</th>
<th>$P^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>First position final diagnosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>15</td>
<td>11</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>ST-elevation AMI</td>
<td>6</td>
<td>7</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Non-ST-elevation AMI</td>
<td>9</td>
<td>5</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Unstable angina pectoris</td>
<td>4</td>
<td>7</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Final diagnosis, any position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>16</td>
<td>13</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Unstable angina pectoris</td>
<td>5</td>
<td>7</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>Findings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronary angiography performed</td>
<td>18</td>
<td>18</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Main stem stenosis$^b$</td>
<td>9</td>
<td>0</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Triple vessel disease$^b$</td>
<td>30</td>
<td>22</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Two vessel disease$^b$</td>
<td>34</td>
<td>26</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>One vessel disease$^b$</td>
<td>22</td>
<td>39</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>No coronary artery disease$^b$</td>
<td>14</td>
<td>13</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Echocardiography performed</td>
<td>31</td>
<td>31</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>EF $&lt;50%$$^c$</td>
<td>23</td>
<td>21</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>EF $&lt;30%$$^c$</td>
<td>4</td>
<td>3</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Secondary preventive activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid analysis $&lt;24$ h after onset of symptoms</td>
<td>51</td>
<td>45$^e$</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Discharged alive from hospital$^d$</td>
<td>95</td>
<td>95</td>
<td>0.72</td>
<td></td>
</tr>
</tbody>
</table>

$a$Age adjusted.

$^b$Of those where angiography was performed.

$^c$Of those where echocardiography was performed.

$^d$Only patients with acute coronary syndrome as first final diagnosis.

$^e$5–10% missing.
Another finding of this study deals with the difference between NSS and SS patients in the hospitalization rates (64 versus 54%), although no statistically significant differences in diagnosis, coronary angiographic findings or echocardiographic findings were detected between the two groups. This suggests that healthcare providers may be lowering the requirements for hospitalization of NSS patients, possibly as a way of circumventing the additional difficulties in communica-
tion and diagnosis posed by NSS. The higher risk of hospital-
ization associated with language barriers is in accordance with
the findings in previous research [11]. Albeit praiseworthy from
an equity point of view, the lowering of hospitalization require-
ments found in this study can also be seen as a waste of healthcare
resources that may be prevented if language barriers are over-
come, such as by using appropriate interpreter services. As claimed
in previous research [19], these services need, however, to be
improved both in equality and availability. In this study, interpreter services were deemed necessary in
8% of the total number of visits, which represents nearly half
of the proportion of foreign-born patients living in the Västra
Göteborg region.

No statistically significant differences were found between
NSS and SS patients in diagnosis, coronary angiographic and
echocardiographic findings, secondary preventive activities
performed and in-hospital death rate. Overall, there were few
variables in this study for which it was possible to find indica-
tions of unequal care in the treatment of acute chest pain with
respect to patient language proficiency. This should however
not be interpreted as equality of care. As the NSS group in this
study was reasonably small, it is expected that only large differ-
ences in the treatment of NSS and SS have been detected, i.e.
attained statistical significance [41]. Still, the reduced number
of differences detected suggests some degree of equality,
which contrasts with previous non-Swedish studies on racial
and ethnical discrimination in cardiac care [32, 33]. The sugges-
tion of equality derived from this study finds nevertheless
support in another Swedish study in which differences in the
treatment of patients hospitalized for heart failure with regard
to immigrant status were investigated. It is, thus, possible that
the largest differences between NSS and SS may lie outside
hospital care. Either before, in primary prevention, or after, in
rehabilitation and secondary prevention, can one expect to
find the differences that substantially explain the inferior
health and well-being of NSS patients.

Future research

Prospective longitudinal studies may be required in the future
for increased control of patient language proficiency, the
varying perceptions of healthcare providers and agents of
interpreting. Likewise, qualitative studies on the mechanisms
behind the potential time delays in care for NSS are recom-
ended. Researchers are also encouraged to conduct a larger
study including more patients in the NSS group in order to
be able to detect smaller differences between the care delivered
to SS and NSS patients and to provide a more accurate answer to
the question of equitable care between the two groups. Since
this study focuses on hospital care, a possible extension of this
study could be the inclusion of other variables related to the
lifestyle of patients, primary care and prevention and rehabili-
tation care and secondary prevention.

Recommendations to practitioners

This study aims primarily at detecting differences between
NSS and SS patients that can be used for improvement pur-
poses. Thus, with a starting point in the differences identified,
such as the 43-min difference in \( \Delta T_{\text{HOSP-PCI}} \) and the 10% unit
difference in the hospitalization rate, practitioners are recom-
ended to initiate improvement cycles in order to shed light
on the root causes of those differences. Once the root causes
are known, potential remedial actions can be tested and
checked for their effectiveness. The learning resulting from the
improvement cycles should be shared both within the organ-
ization, as well as across organizations, and should be accom-
panied by the institutionalization of improvements.

Limitations

As the data were collected retrospectively, this study was more
vulnerable to the potentially distorting effects of missing data.
Nevertheless, the percentage of missing data concerning the
grouping variable used in this study, i.e. ‘need for interpreter’
as low as 2%. Moreover, the retrospective nature of the
study yielded the benefits of unobtrusiveness in daily opera-
tions and decreased reactivity bias. Concerning the grouping
variable used in this study, it is an imperfect proxy for language
proficiency as the perceptions of patients can depend on other
factors, e.g. personality traits, and those of healthcare provi-
ders’ may differ substantially from provider to provider.
Despite these limitations, the NSS can be said to represent the
fraction of the immigrant population with most seriously
limited Swedish proficiency and ought not to be equated with
the immigrant population as a whole.

The quality of the reported time variables was particularly
important and challenging as there were multiple sources of
error, for instance clock calibration and delay between occurre-
rence and manual registration of times. Nevertheless, as this
paper focused on the difference between median times for
large groups, the risks derived from inaccuracy were less prom-
inent than in the case of individual times. Several sources of
error were expected to be random and thus cancel out each
other across a large group and even systematic errors were of
less concern as long as they affected both NSS and SS to
similar extent.

Considering the large number of significance tests per-
formed in this study, the statistical significance level could have
been lowered in order to reduce the risk of mass significance.
However, this study has an exploratory character and aims pri-
marily at identifying differences that constitute future oppor-
tunities for improvement. Thus, it seemed advisable at the
early stages of improvement work to be less conservative in
terms of statistical significance level at the expense of increased
risk of identifying differences as significant that are due to
chance. The tables attached contain \( \sim 60 \) significance tests at
the 5% significance level, which means that one can expect
on the average three tests to be either falsely negative or falsely positive. The study is limited to cases of acute chest pain, which raises difficulties in the generalization of findings to other patient groups, particularly those for whom communication assumes an even more prominent role, such as within psychology. Moreover, patients dwell in an urban area, and they were treated on a university hospital level. Caution is hence advised when extrapolating the results of the study to the situations of patients dwelling in more sparsely inhabited areas or to healthcare providers with a lower volume of patients or technical competence than in the present study.

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