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Disparities in emergency department access, resource allocation, and outcomes between migrants and the local population

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Summary

AIMS: To characterize a group of migrant emergency department (ED) patients regarding demographics, access to the ED, mode of referral, use of resources, and short-term outcomes, and to compare them to a group of local ED patients.

METHODS: Prospective cohort study with consecutive enrollment of adult patients presenting to the ED of a Swiss tertiary care hospital from October 21st to November 11th, 2013 and February 1st to February 23rd, 2015. In accordance with the International Organization for Migration, we defined migrants as persons who have changed their country of usual residence, irrespective of their legal status. The primary outcome was defined as the number of resources allocated to migrants, as compared to local patients, using uni- and multivariable quasi-Poisson regressions. Acute morbidity, hospitalization, intensive care unit (ICU) admission, and 30-day mortality were assessed as secondary outcomes.

RESULTS: Migrant patients were younger, more often male and self-presenters, and of lower acuity. After adjustment for age, gender and acuity, we observed a non-significant difference of 3.6% in the mean number of resources allocated to migrant patients as compared to local patients (adjusted RR 0.964, CI 0.923-1.006). No difference in 30-day mortality (adjusted OR 0.777, CI 0.346-1.559) was observed between the two patient groups, but migrant patients had lower odds of acute morbidity (adjusted OR 0.652, CI 0.560-0.759), hospitalization (adjusted OR 0.666, CI 0.555-0.799), and ICU admission (adjusted OR 0.649, CI 0.456-0.910).

CONCLUSIONS: ED access approximation, resource allocation, and mortality were comparable between migrant patients and local patients. Lower admission rates to wards and the ICU may raise concerns but can be explained by lower acute morbidity in migrant patients.

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Introduction

Access to emergency medicine is a human right [1]. Certain essential elements of the right to health, such as availability and quality, seem – when applied to emergency medicine [2] – to be a given in European health care systems. Other elements, such as accessibility and acceptability of emergency medicine, are not universal and need to be explored, as the protection of vulnerable populations (e.g. migrants) from discrimination is an important part of medical ethics and culture.

However, the adequate use of emergency medicine is a controversial issue. Underuse and overuse are difficult to define, as patients who receive a diagnosis of a low-acuity condition often present with initial complaints similar to patients with more serious conditions [3]. Though certain types of complaints may be predictive of serious outcomes [4, 5], true low-acuity presentations are rather rare and myths about emergency department use are more common than facts [6]. Similar considerations can be made regarding the adequate use of resources for work-up in the emergency department (ED). However, one of the main advantages of the comprehensive use of triage tools such as the Emergency Severity Index (ESI) is that the use of resources can be compared according to acuity level [7].

Migration is considered an important social determinant of health [8, 9], and migrants in Switzerland (about 30% of adult residents have a migration background [10]) have lower self-reported health [11]. However, there are conflicting data about mortality compared to the local population [12, 13].

Access to the ED and the adequacy of ED resource allocation in migrants have rarely been studied [14, 15, 16]. Enduring beliefs about migrants, e.g. having poorer treatment in the ED, may be intuitive, but are oversimplifications. Such beliefs seem to depend on individual experiences in different health care systems [15]. Other beliefs, only scarcely supported by data, are that migrants have less access [16], consult out-of-hour care more often [17], or might have a distorted perception of urgency [18]. Most data on ED and resource use of migrants originates from the US, where their access to health care is poorer [19], even in children [20].

While the "healthy migrants effect" [21] describes a selection of healthy workers migrating to higher income coun-

tries, the "salmon bias" describes the re-migration of a sicker population [22]. However, there is a lack of research, particularly in Europe, and no single model can explain the reported differences between migrant and local populations [16, 22, 23].

Furthermore, there is no consensus on the definition of "migrant" [24]. Migrant status does not rely on citizenship alone, but rather on socio-cultural factors such as the type of education and health care system experienced during adolescence and early adulthood.

Therefore, our aim was to characterize a group of migrant ED patients regarding demographics, access to the ED, mode of referral, use of resources, and short-term outcomes, and to compare it to a group of local ED patients.

We hypothesized that migrants may have poorer access to the ED, could receive fewer resources during work-up, and might have poorer outcomes compared to the local population. We chose the number of resources at ED work-up as the primary outcome for group comparisons, as this measure is an important benchmark.

Material and methods

Study design and setting

We conducted a single-center, prospective cohort study with consecutive enrollment of patients presenting to the ED of the University Hospital of Basel, a tertiary care center with approximately 54,000 ED visits per year. Obstetric, ophthalmological, and pediatric patients are treated in separate facilities nearby. Study enrollment was conducted by a trained study team who worked 24 hours a day, 7 days a week in three shifts during an overall time period of six weeks from October 21st to November 11th, 2013 and February 1st to February 23rd, 2015. The study was registered and approved by the local ethics committee (http://www.eknz.ch, Ref. No 263/13) and was conducted in compliance with the WMA Declaration of Helsinki. The study design, data collection, analysis and presentation are all in accordance with the STROBE guidelines [25].

Population and inclusion criteria

All adult patients presenting to the ED during the study period were eligible for the study and were included if they were able to answer questions and give verbal informed consent. Written informed consent was waived by the ethics committee because of a potential for inclusion bias. Patients in need of life-saving interventions, such as resuscitation, were not included in the study.

Data collection

The study team members were trained to conduct interviews with physicians, emergency nurses, and patients and their proxies using standardized questionnaires and to obtain information from the hospital's internal electronic health records database (ISMED® by Protec-Data, Boswil, Switzerland). All patients underwent triage by an emergency physician or emergency nurse, who assigned the correct Emergency Severity Index (ESI) [7] to each patient. Immediately after triage, a trained study member conducted the interviews, collected all relevant data from either the staff or the electronic health records, and entered the data into the electronic database provided by HCRI (Health Care Institute AG, Zürich, Switzerland).

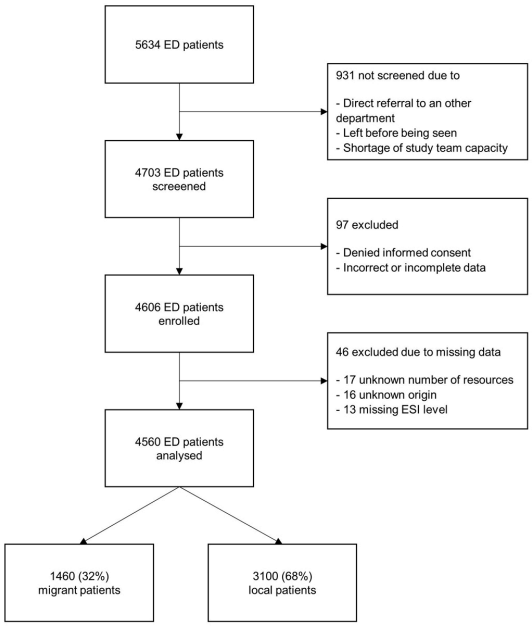
Thirty-day follow-up was obtained by conducting standardized phone calls with patients, relatives, and/or general practitioners 30 days after ED presentation. Additionally, the patients' electronic health records, as well as the residents' registration offices, were consulted for further information, such as survival.

Definition of study variables

Migration status: We used the definition of migrants of the International Organization for Migration (IOM) [26]: they define a migrant as 'someone who changes his or her country of usual residence, irrespective of the reason for migration or legal status' [26]. Therefore, to obtain their country of usual residence, patients were asked where they were born and raised (e.g. where they went to school), and their legal status (e.g. passports, residence permit, refugee status) was not considered for categorization. Countries of origin were allocated to the following regions: Central or Northern Europe, Mediterranean, Southeast Europe, Eastern Europe, Turkey, Africa, Asia, North America, Australia, and Central or South America. As countries in Central and Northern Europe have similar health care systems, a similar understanding of health and health literacy [11,27], and have low language barriers, which have shown to influence health care seeking behaviour [28, 29, 30, 31, 32], we considered patients from Central and Northern Europe, including Switzerland, as local patients, whereas patients originating from other regions were considered migrants. The IOM definition was chosen because where someone was raised and received basic education, influencing their health literacy, is of more importance than their legal status per se [33].

Access to the ED: The following two methods were used: for an approximation of the general ED access by migrants

Figure 1: Flow of patient inclusion. A total of 143 patients were excluded, leaving a final study population of 4,560 ED patients, consisting of 1,460 (32%) migrant and 3,100 (68%) local patients.



compared to the local population, we compared the percentage of migrants in the study population to the percentage of foreign persons in the cantons of Basel and Basel-land at the end of 2015 – consulting the Statistical Offices of both cantons. For the calculation of acuity-based access we compared ESI strata between migrants and the local population.

Resources: The resources used during ED work-up were counted and summarized, with a maximum of 11 possible resources from the following categories: laboratory analyses, sonography, echocardiography, duplex sonography, endoscopy, computed tomography, magnetic resonance imaging, interventional radiology, plain X-ray, electrocardiography, and consultation by a specialist. Each category was only counted once (e.g. multiple lab tests were summarized as "laboratory analyses", which was counted as one resource). The count of resources for each patient was used for calculation.

Acute morbidity: Acute morbidity was adopted according to a defined framework consisting of 14 elements: administration of antibiotics, virostatics, antifungals, immunosuppressives, diuretics, anticoagulants, antihypertensives, and procoagulants; the need for invasive interventions or prolonged monitoring; new neurological deficits or seizures; fractures; or self-harm [34]. If any of these elements were present, the outcome of acute morbidity was met. This outcome has been described in detail by a validation study [34].

Hospitalization: Hospitalization was defined as any admission to a hospital ward after ED presentation with at least one overnight stay.

ICU admission: All patients admitted to a medical or surgical intensive care unit or a stroke unit during their index hospitalization were counted as ICU admissions.

30-day mortality: Any death occurring within 30 days after the index ED presentation was considered for 30-day all-cause mortality.

Outcome measures and statistical analysis

The primary outcome was defined as the number of resources allocated to the individual patient during ED work-up.

Secondary outcomes were acute morbidity, hospitalization, ICU admission, and 30-day mortality.

Re-presentations were not excluded from the analysis and are shown in table 1.

Table 1:
Baseline demographics

	All patients	Migrant patients	Local patients	P	Missing values
N (%)	4,560 (100%)	1,460 (32%)	3,100 (68%)		
Age (median [IQR])	51 [34, 72]	39 [29, 53]	60 [39, 77]	<0.001	–
Male gender (%)	2,355 (51.6%)	802 (54.9%)	1,553 (50.1%)	0.003	–
Mode of referral (%)				<0.001	23
– Self-referral	2,901 (63.9%)	1,137 (78.1%)	1,764 (57.2%)		
– Referred by physician/hospital	576 (12.7%)	118 (8.1%)	458 (14.9%)		
– Referred by EMS	1,024 (22.6%)	179 (12.3%)	845 (27.4%)		–
– Referred by fire department/police	36 (0.8%)	21 (1.4%)	15 (0.5%)		
ESI (%)				<0.001	–
– 1	91 (2.0%)	16 (1.1%)	75 (2.4%)		
– 2	1,018 (22.3%)	277 (19.0%)	741 (23.9%)		
– 3	1,778 (39.0%)	491 (33.6%)	1,287 (41.5%)		
– 4	1,533 (33.6%)	613 (42.0%)	920 (29.7%)		
– 5	140 (3.1%)	63 (4.3%)	77 (2.5%)		
Time to first contact with physician (min) (median [IQR])	30 [14, 58]	32 [16, 64]	29 [13, 55]	<0.001	157
Number of resources (%)				<0.001	–
0	815 (17.9%)	344 (23.6%)	471 (15.2%)		
– 1	1,221 (26.8%)	458 (31.4%)	763 (24.6%)		
– 2	1,065 (23.4%)	335 (22.9%)	730 (23.5%)		
– 3	946 (20.7%)	231 (15.8%)	715 (23.1%)		
– 4	387 (8.5%)	72 (4.9%)	315 (10.2%)		
– 5	109 (2.4%)	17 (1.2%)	92 (3.0%)		
– 6	17 (0.4%)	3 (0.2%)	14 (0.5%)		
Number of symptoms (median [IQR])	2 [1, 3]	2[1, 4]	2 [1, 3]	0.021	637
Re-presentations (%)	269 (5.9%)	93 (6.4%)	176 (5.7%)	0.391	–
LOS on ED (min) (median [IQR])	190 [107, 302]	170 [93, 280]	200 [117, 314]	<0.001	–
LOS hospitalized (days) (median [IQR])	5 [2, 10]	4 [2, 9]	5 [2, 10]	0.335	–
Acute morbidity (%)	1,696 (37.2%)	368 (25.2%)	1,328 (42.8%)	<0.001	–
Disposition (%)				<0.001	–
– Outpatient	3,032 (66.5%)	1,176 (80.5%)	1,856 (59.9%)		
– Inpatient	1,528 (33.5%)	284 (19.5%)	1,244 (40.1%)		
ICU admission (%)	296 (6.5%)	50 (3.4%)	246 (7.9%)	<0.001	–
30-day mortality (%)	108 (2.5%)	9 (0.7%)	99 (3.3%)	<0.001	260

Baseline demographics of all patients, grouped by migration status. IQR = interquartile range, P = p-value. EMS = emergency medical services. The number of missing values per variable are indicated in the last column.

Descriptive statistics were presented as counts and percentages and medians and interquartile ranges. Group comparisons were done using the Kruskal-Wallis test for data with medians, while for categorical data a Chi-square test, or Fisher's exact test in cells with expected frequencies below five, was used. The primary outcome was analyzed by performing uni- and multivariable quasi-Poisson regression, allowing for dispersion. The multivariable model was adjusted for age, gender, and acuity (ESI level). Results are shown as rate ratios (RR) of incidence rate ratios of the populations being compared, along with 95% confidence intervals (CI). Interactions between migration status and age, gender, and ESI level were checked during statistical work-up. The secondary outcomes, acute morbidity, hospitalization, and ICU admission, were analyzed using logistic regression presented as odds ratios (OR), 95% confidence intervals (CI) and p-values (P). The outcome 30-day mortality was assessed using the Cox proportional hazards model and presented as hazard ratios (HR), 95% CI and p-values. All outcomes are shown derived from a univariable approach, as well as adjusted for age, gender, and acuity (ESI level). When adjusting for acuity, ESI 3 was used as the reference level, as it represents the majority of all patients and a medium acuity level.

A p-value of <0.05 was defined as significant.

No formal power analysis was conducted, as the presented analyses are only exploratory for migration status and no published effect sizes were available. Due to the large sample size, it is expected to be sensitive for the outcomes.

The entire analysis was performed using the statistical software R version 4.0.3. (https://www.r-project.org/)

Results

Baseline characteristics

A total of 4,703 ED presentations were eligible for study inclusion. Of these, 46 denied informed consent, 51 had wrong or incomplete data, and 46 were excluded because of missing data in specific variables (17 without known number of resources, 16 without known origin and 13 without recorded ESI level).

This left a study population of 4,560 patients to be analyzed. Median age was 51 (IQR 34-72) and 2,355 (51.6%) patients were male. Of all the patients analyzed, 1,460 (32%) were migrants and 3,100 (68%) were local patients. The most common regions of origin of migrant patients were the Mediterranean countries (n = 442, 30.3%), followed by Turkey (n = 283, 19.4%) and Southeast Europe (n = 243, 16.6%) (For more details, see figure 2).

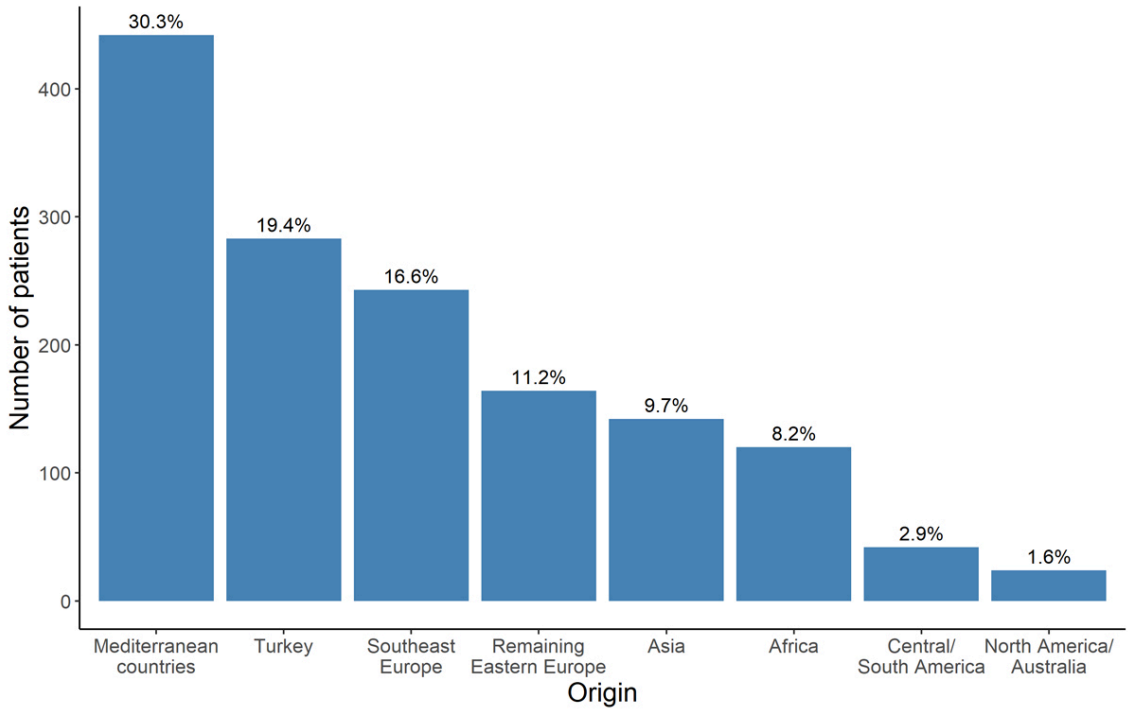
Compared to the local patients, migrant patients were younger, more often male, received no or one resources more often, reported more symptoms, were more often treated as outpatients, and stayed at the ED for a shorter time. For details, see Table 1.

Approximation of ED access

In our study population, migrant patients accounted for 1,460 out of 4,560 (32%) patients. In comparison, 132,891 out of 481,965 (27.6%) persons living in the catchment area were of foreign origin.

The comparison between ESI strata of the local and migrant patients showed that migrant patients were more likely to be triaged into lower acuity levels, such as ESI 4 (n = 613 [42.0%] vs. n = 920 [29.7%]) and ESI 5 (n = 63 [4.3%] vs. n = 77 [2.5%]), and less likely to be triaged into high-

Figure 2: Distribution of regions of origin of all migrant patients included in the study (n =1,460). Regions are shown on the x-axis, absolute count of patients are visible on the y-axis, with the relative numbers (%) indicated above each bar.



er acuity levels, such as ESI 1 (n =16 [1.1%] vs. n = 75 [2.4%]) and ESI 2 (n = 277 [19.0%] vs. n = 741 [23.9%]), than local patients (p <0.001).

Primary outcome: number of resources

Out of 11 potential resources, the median count of resources was 1 (IQR 1-2) in migrant and 2 (IQR 1-3) in local patients, with a range of 0-6 resources in all patients. The less acute the triage level, the fewer resources were used in both patient groups (figure 3).

In the unadjusted, univariable quasi-Poisson regression, the mean count of resources per patient was 23.9% lower in migrant patients compared to local patients (RR 0.761, CI 0.726-0.798, p <0.001).

When adjusted for age, gender, and ESI level, a mean difference of 3.6% was observed, which was not statistically significant (RR 0.964, CI 0.923-1.006, p = 0.093) (for more details see table 2).

Secondary outcomes: acute morbidity, hospitalization, ICU, 30-day mortality

Acute morbidity was observed in 368 (25.2%) migrant and 1,328 (42.8%) local patients (p <0.001). Hospitalization was required in 284 (19.5%) and ICU admission in 50 (3.4%) migrant patients, compared to in 1,244 (40.1%) hospitalizations and 246 (7.9%) ICU admissions in local patients (p <0.001). Of the migrant patients, 9 (0.7%) died within 30 days, compared to 99 (3.3%) local patients (p <0.001).

In the univariable logistic regression, lower odds for all outcomes were observed in migrant patients (see forest plots in figure 4).

When adjusted for age, gender, and acuity, migrant patients were less likely to suffer acute morbidity (OR 0.652, CI 0.560-0.759, p <0.001), less likely to be hospitalized (OR 0.666, CI 0.555-0.799, p <0.001), or to be admitted to the ICU (OR 0.649, CI 0.456-0.910, p = 0.014), but equally likely to die within 30 days (HR 0.765, CI 0.377-1.55, p = 0.457).

Figure 3: Comparison of the median number of resources per ESI level, stratified according to migration status. ESI levels are indicated on the x-axis, the count of resources is indicated on the y-axis. Medians are represented by a horizontal line inside the box, interquartile ranges are represented by the box borders.

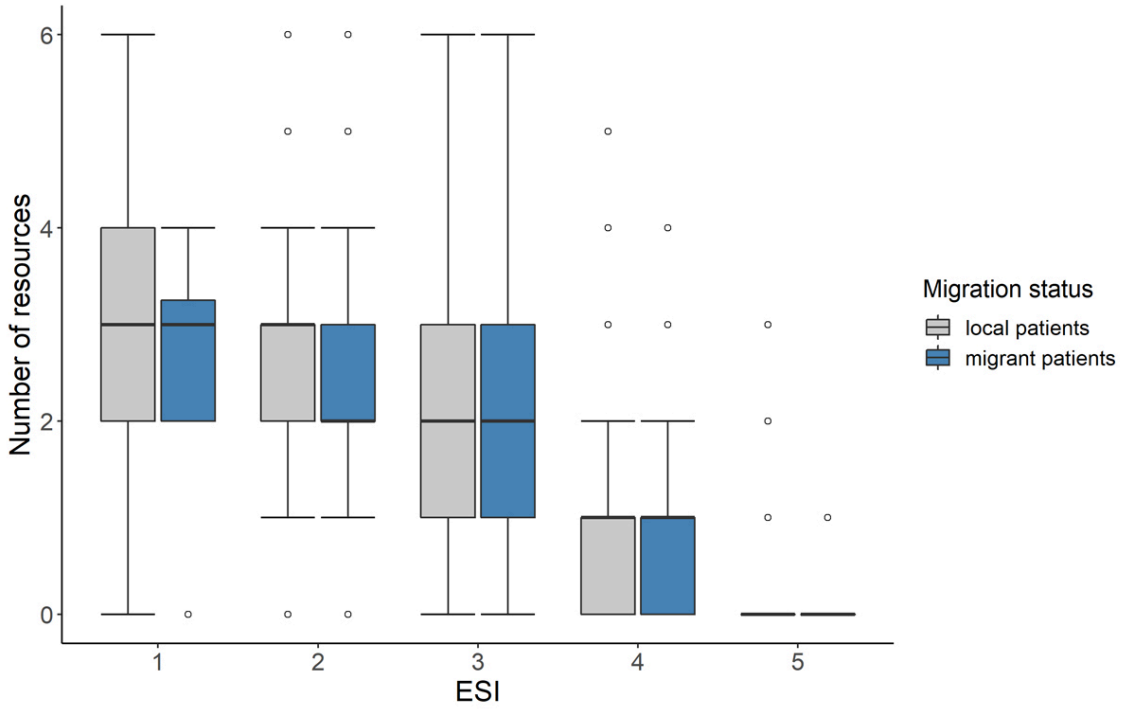


Table 2:
Multivariable quasi-Poisson regression for the primary outcome.

	RR	95% CI	P
Migrants	0.964	0.923-1.006	0.093
Female gender	1.002	0.967-1.038	0.931
Age per decade	1.076	1.066-1.086	<0.001
ESI 1	1.188	1.068-1.317	0.001
ESI 2	1.19	1.142-1.239	<0.001
ESI 4	0.477	0.452-0.502	<0.001
ESI 5	0.061	0.040-0.887	<0.001

The table comprises results of a multivariable quasi-Poisson regression for the primary outcome number of resources, including the following independent variables: migration status, age (per decade), gender and ESI level. ESI 3 was used as the reference category. All rate ratios are adjusted for the variables included in the table. RR = rate ratio; 95% CI = 95% confidence interval, P = p-value.

Increasing age was associated with a higher risk for acute morbidity (per decade, OR 1.21, CI 1.17 -1.25, p <0.001), hospitalization (per decade, OR 1.423, CI 1.374-1.488, p <0.001), ICU admission (per decade, OR 1.156, CI 1.081-1.239, p <0.001), and 30-day mortality (per decade, HR 2.097, CI 1.765-2.491, p <0.001) in all patients.

Female gender was significantly associated with a lower risk for acute morbidity (OR 0.872, CI 0.766-0.993, p 0.039) but showed no effect on hospitalization (OR 1.028, CI 0.883-1.197, p = 0.726), ICU admission (OR 0.807, CI 0.624-1.042, p = 0.101), or 30-day mortality (HR 0.911, CI 0.622-1.334, p = 0.632).

In comparison to ESI 3, adverse outcomes were more likely in ESI 1 and ESI 2 and less likely in ESI 4 and ESI 5.

Discussion

The main findings of the study were the apparent disparities between migrant and local ED patients regarding demographics, ED access, mode of referral, ED use of resources, and outcomes.

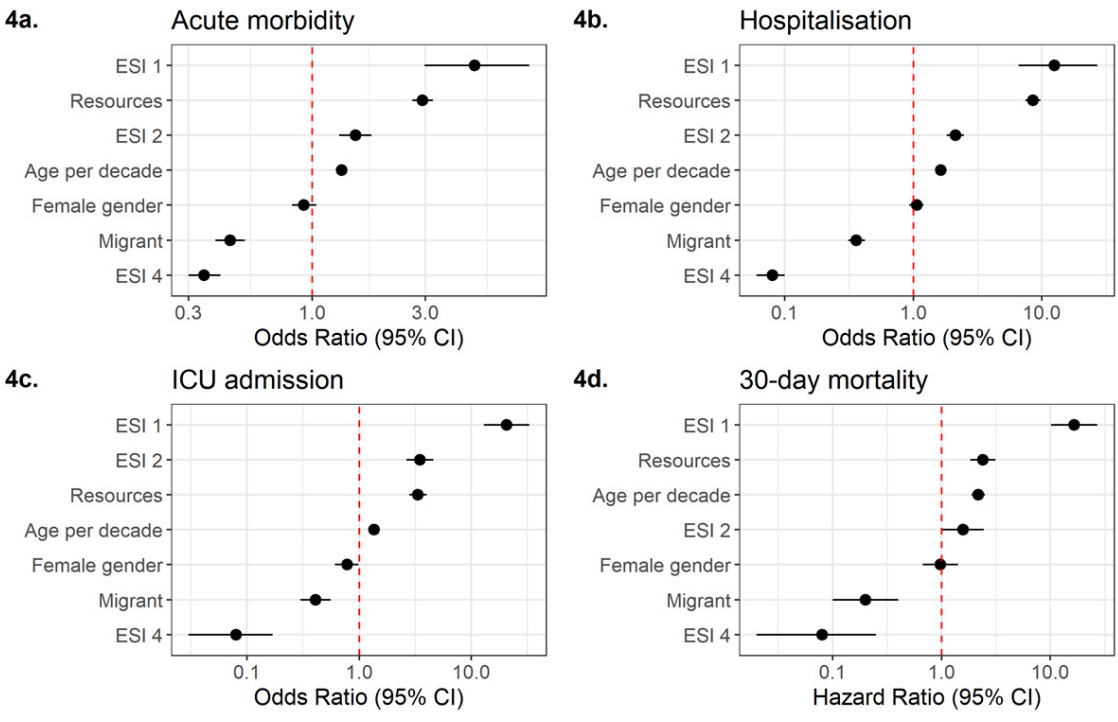
In contrast to our hypotheses, migrants do not seem to have less access to the ED, received similar resources at work-up, and had comparable, if not better, outcomes when the chosen, and most probably relevant, confounders were taken into account. Most importantly, the migrant population, being younger, more often male and self-presenting, of lower triage acuity, and of lower acute morbidity and mortality, can clearly be distinguished from the local population. This could be shown using univariable analyses.

On the other hand, such comparisons need to be adjusted for the relevant confounders, such as age, gender, and acuity, in order to compare similar groups of patients. After these adjustments, the primary outcome (resources during ED work-up) showed no significant difference between the groups. If acuity is not considered as a confounder, a mean difference in resource consumption per patient of 6% would still be too small to be relevant. Furthermore, we checked for interactions between migrants' age, gender, and acuity, but none were found, except for ESI 4. Due to the complexity of interpretation, however, we did not take this single interaction further into account. Taken together, migrants were comparable to local patients in terms of the resources used.

Multivariable analyses of secondary outcomes showed no differences between migrants and locals regarding 30-day mortality, but a 35% lower rate of acute morbidity in migrants.

How do these results compare with the literature [18]? While migrants seek primary care less often, they seem to be overrepresented in EDs in Switzerland [35] and other European countries [36, 37, 38], in contrast to US data [19]. Migrants presenting to EDs were previously shown to be younger and of lower acuity in Switzerland [39,40] and in Europe [41], suggesting possible barriers to primary care [36]. Notably, a large proportion of our migrant population are of Southeastern European or Turkish origin, where primary care is less abundant and presenting directly to hospital EDs is more common [42, 43]. Other reasons may be that the local population grow up within the health care system and have a longstanding attachment to their

Figure 4: Univariable logistic regression of a. acute morbidity, b. hospitalization, and c. ICU admission, and univariable Cox regression of d. 30-day mortality. Odds ratios (OR) and hazard ratios (HR) are presented on the log10-transformed x-axis, independent variables are presented on the y-axis. OR/HR for age are indicated per decade. Numeric variables were IQR standardized. OR/HR are presented as black dots and the corresponding 95% confidence intervals as black horizontal lines. The red dotted line indicates an OR/HR of 1.0. ESI 3 was used as the reference category and ESI 4 and 5 were merged into ESI 4, as no events were detected for 30-day mortality in ESI 5. Abbreviations: *ESI Emergency Severity Index.*



family physician, while migrants tend to be healthy at immigration [21] and have no safety net apart from the ED. Our approximation of the access to the ED by migrants did not show any evidence for poorer access, as the percentage of migrant patients in the ED was not lower than the foreign population and the acuity strata comparison showed no overrepresentation of higher acuity in migrants. In contrast to common beliefs, it was shown that emergency physicians did not allow migrant status to obstruct delivery of emergency care [15]. Furthermore, a study distinguishing countries referred to as 'culturally and linguistically diverse (CALD)', as opposed to English-speaking patients, showed no evidence of different outcomes between the groups [44].

We are not aware of any other studies comparing the use of resources or acute morbidity between migrant and local patients. Therefore, the presented data are a new finding, corroborating data showing comparable outcomes between these groups of ED patients.

Several critical aspects and questions need to be discussed.

First, is the primary outcome adequate? In spite of the lack of data on the use of resources by migrants, we believe that this outcome is important for benchmarking, as several dozen prospective observations on acuity stratification in EDs are available [45]. Most have shown that the number of resources can be predicted by the level of acuity. Therefore, acuity strata can be compared across health care systems and continents. Resources allocated at work-up may also be taken as a proxy for over-diagnosis in all-comer cohorts where no disease-specific measurements can be considered.

Second, were the right patients analyzed? As the demographic features were comparable to the populations living in Northwestern Switzerland, we believe that the concept of separating populations by origin rather than citizenship is feasible for this and possibly other studies.

Third, is a comparison between migrants and locals important and justified? In spite of possible political issues, we believe that such analyses are important in order to probe for discrimination against vulnerable patient groups. Several examples can be cited: older ED patients are at higher risk of undertriage [46], females may be underdiagnosed and undertreated in myocardial infarction [47], and less acculturated Hispanic individuals are less likely to use the ED in the US [48]. Regular benchmarking could also contribute to developing measures against overuse or underuse of emergency services. However, comparisons between migrants and locals can be perceived as unfair due to inherent thresholds to primary care, such as socialization or the language barrier that is eased in an ED, where dozens of languages are spoken by caregivers. Finally, myths on overuse or underuse of emergency medicine by migrants, virulent in the general population and even among caregivers, can be dismantled.

In Summary, the migrant population presenting to a Swiss emergency department is significantly younger and shows better outcomes than the local population. This effect is largely due to the fact that the local population's triage mix tends to higher acuity and older age. Most differences between the local and migrant populations vanish after adjustment for age, gender, and acuity. ED access could only be roughly approximated due to missing data on the chosen definition of migrant status (IOM definition), but the available data (legal status) did not suggest any relevant differences. However, we believe that only regular monitoring of such data may reveal discrimination against minorities, such as migrant ED patients.

Limitations

The prospective design, with consecutive sampling of an all-comer cohort of ED patients, is a major strength of this study, as it minimizes selection bias. However, several limitations must be taken into account. First, this was a single center study, limiting its external validity. Second, the definition of migrants used differs from that of most studies and locals include patients from other countries of origin within Northern and Central Europe. Considering the similar results regarding demographics compared to previously published data and in view of the facts that acculturation leads to fewer differences and legal status per se is not the determinant of differences, this seems to be justified [35, 49]. Third, ED access by migrants could only be approximated by comparing the proportion of migrants in the study population to the proportion of foreigners in the surrounding area, which are two different populations. Data on the origin (according to the IOM definition) of the population are not available. This is an important limitation to the comparison of ED access between migrants and the local population in this study. Fourth, we did not differentiate between the different immigrant groups, in which outcomes are heterogeneous [50], and we might therefore have missed differences in specific subgroups. Additionally, possible confounders such as the patients' socioeconomic status, their IQ, literacy, medical knowledge, and many others, all potentially influencing health care seeking patterns [51], were not recorded due to resource constraints. They could therefore not be considered as potential confounders in the analysis or used to analyze heterogeneity within both groups. Fifth, we had incomplete 30-day follow-up data, with 260 missing values. Taking into account the study size, this probably did not have a major effect on the outcomes.

Conclusion

In spite of the apparent disparities between migrant and local ED patients regarding demographics, ED access, mode of referral, ED use of resource, and outcomes, we did not find evidence for true differences after correction for the major confounders. In migrants, lower admission rates to wards and the ICU may raise concerns, but can be explained by lower acute morbidity.

Data sharing statement

Data cannot be made available without written consent from the local ethics committee. Data sharing requests will be forwarded to the ethics committee. In the case of acceptance of the request, the data can be shared in fully anonymized form.

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Conflicts of interest

Prof. Bingisser and Prof. Nickel report being editors of medStandards.com. None of the other authors have any conflicts of interest to declare.

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