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## **Effect of emergency physician burnout on patient waiting times**

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## **ABSTRACT**

**Objectives:** Burnout is common amongst emergency physicians. This syndrome may negatively affect patient care and alter work productivity. We seek to assess whether burnout of emergency physicians impacts waiting times in the emergency department.

**Methods:** Prospective study in an academic ED. All patients that visited the main ED for a four month period in 2016 were included. Target waiting times are assigned by triage nurse to patients on arrival depending on their severity. The primary endpoint was an exceeded target waiting time for ED patients. All emergency physicians were surveyed by a psychologist to assess their level of burnout using the Maslach Burnout Inventory. We defined the level of burnout of the day in the ED as the mean burnout level of the physicians working that day (8:30 to the 8:30 the next day). A logistic regression model was performed to assess whether burnout level of the day was independently associated with prolonged waiting times, along with previously reported predictors.

**Results:** Target waiting time was exceeded in 7,524 patients (59%). Twenty six emergency physicians were surveyed. Median burnout score was 35 (Interquartile [24-49]). A burnout level of the day higher than 35 was independently associated with an exceeded target waiting time (adjusted odds ratio 1.54, 95% confidence interval 1.39 to 1.70), together with previously reported predictors (i.e. day of the week, time of the day, trauma, age and daily census).

**Conclusion:** Burnout of emergency physicians was independently associated with a prolonged waiting time for patients visiting the ED.

YF had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors had also full access to data. Complete database can be obtained via the corresponding author (YF).

This study has not been funded, no compensation has been received. This study is not currently submitted elsewhere, and has not been presented anywhere.

All authors declare that they have no conflict of interest with this study.

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## INTRODUCTION

Burnout is common among physicians,<sup>1,2</sup> and emergency medicine is reported to be the specialty with the highest risk of burnout.<sup>3</sup> Burnout is a syndrome that consists of emotional exhaustion, depersonalization and a sense of low personal accomplishment. It may have negative consequences for personal health such as increased risk of addictive behavior, substance abuse and suicidal tendencies.<sup>4,5</sup> A high level of burnout affects productivity and may increase the risk of adverse events for patients.

In the emergency department (ED), waiting time (WT) to see a physician is a matter of great concern. Prolonged WT in the ED has been reported to be associated with worse outcomes and a higher risk for delayed treatment and adverse events.<sup>6-9</sup> For these reasons, WT is a key performance indicator in many countries and one of the several quality indicators of the National Quality Forum.<sup>10,11</sup> There are a few previously reported independent predictors of prolonged WT (time of day of the ED visit, age of the patient, overcrowding or daily census for example).<sup>12-15</sup> However, studies investigating factors associated with a prolonged WT have so far only analyzed factors at the patient level or the ED level, whereas data on the provider (emergency physician) have not been examined.

As WT between patients of varying acuity may not be comparable, we considered that patients experienced a prolonged WT when their wait to see a physician exceeded the relevant target WT. This is defined as the maximal recommended WT depending on the acuity on a 1 to 5 scale level (respectively 0, 20, 60, 120 and 240 min), as previously described.<sup>13</sup> This severity triage scale is widely used in France and recommended by the French Society of Emergency Medicine.<sup>12,16,17</sup>

The goal of this investigation is to assess whether a high level of burnout among physicians working at the ED on a given day is associated with a higher risk of exceeding WT for patients visiting the ED that day.

## **Methods**

### **Design**

This was a monocenter cross-sectional study in a large urban academic ED. Our center has an annual census of 75,000 patients, in a 1,800 bed hospital. We enrolled all adult patients who attended our ED from January 1, 2016, to May 1, 2016. As described elsewhere,<sup>13</sup> immediately after entering the ED demographic data are recorded by a clerk and the time of arrival is electronically recorded. Then the patient is assessed by a triage nurse who assigns a severity triage score on a 1 to 5 scale (1 being the most severe), depending on vital parameters, medical history and chief complaint. Each score on this severity triage scale is associated with a target WT until assessment by an emergency physician. The primary objective of the study was to assess whether burnout level of emergency physicians working on a given day was an independent predictor of prolonged WT for patients who visited the ED that day. We followed STROBE recommendations for the reporting of observational studies.<sup>18</sup>

### **Selection of participants**

All ED visits during the recruitment period were identified using our electronic medical record software (Urqual; McKesson, San Francisco, CA). We excluded patients aged less than 18 years, patients with missing data regarding their WT in the ED, and patients with a severity triage level 1, as they were to be seen immediately and their target WT is null (therefore always exceeded). We also excluded patients that were

visiting the ED to seek other specialist advice, such as maxillo-facial surgery, dentist, psychiatrist, or nurse appointments. Finally, we removed planned revisits to the ED.

### **Outcomes measured and data collection**

The WT is defined as the interval between the time of arrival and the electronic record of the time when the emergency physician and the patient meet in the examination cubicle. This electronic method has been reported to be accurate in a previous study.<sup>19</sup> We retrieved data regarding WT and other characteristics of the ED visit through our electronic medical record software, which includes previously described predictors of exceeded WT: day of the week, time of the consult, trauma patients, age, departmental occupancy of the day and severity triage.

Our primary endpoint was an exceeded target WT, defined as a WT longer than the target WT given by the severity triage scale assigned by the triage nurse. We considered that a day was a 24h period from 8:30 am, as this is consistent with our organization, especially regarding physician shifts that start at 1 pm or 6 pm until the following morning (8:30 am). For example, a patient visiting the ED on a Tuesday at 2 am would be considered a patient from the day before – for data purposes they would be amongst patients that entered the ED during the Monday, and will be treated by physician who started their shift the day before, unlike a patient arriving at 9 am on a Tuesday. We dichotomized between patients that arrived during the afternoon or the evening (from 12 am to 11:59 pm) and others. To estimate daily occupancy, we calculated for each day the ratio of the daily census to the median daily census during the study period, and then dichotomized between “bad day” (more visits than median) and “good day” (less visits than median).

We also included in this study patients of low acuity that were treated in the “fast track” part of the ED where minor injuries are managed by our emergency physicians.<sup>20</sup> As physicians are working in either one or the other part of the ED each day, we separated the analysis of this subgroup of low acuity patients. As they do not have the same target WT due to a different triage and pathway, we considered their target WT should be of 60 min for our main analysis, and planned a sensitivity analysis with a threshold of 30 min.

As the study was observational, the institutional review board authorized the study without the need of informed consent for patients (Comite de Protection des Personnes, Ile de France XI, Saint-Germain en Laye, France). Informed consent was sought for emergency physicians before they were interviewed. Because the data were anonymous without possible identification of patients, the Conseil National Informatique et Liberté (CNIL) authorized the study.

### **Burnout assessment**

At the beginning of the study period, we surveyed all emergency physicians working at our ED. After they consented to participate in the study, a psychologist conducted a telephone interview to assess their burnout level, along with other psychological components. During the 30 min interview, she evaluated their burnout level using Maslach Burnout Inventory (MBI).<sup>21</sup> The MBI comprises 22 questions to explore the three components of burnout syndrome; namely depersonalization, emotional exhaustion and sense of personal accomplishment. A MBI score was then calculated for all responders, as the sum of the three components (emotional exhaustion + depersonalization + (48 – personal accomplishment)). The MBI score has been previously validated and is the most common used scale to assess burnout level



among physicians.<sup>2,3,21</sup> Moreover, the MBI has good test-retest validity over a few weeks.

We assigned for each day of the study period a “burnout score” that was the mean of the MBI score of all physicians working in the ED that day. In our ED, there are 6 physicians working during each week days (7 on Monday, as it is a more busy day), and 4 each week end. Physicians work for 10-hour shift during the day (starting at 8:30, 10:30 or 12:30). During the night, our center is staffed with two emergency physicians doing 14-hour shift starting at 18:30 on week days, and 20-hour shift starting at midday during the week end. This rota is effective for a few years and is adapted from the patients flow – busier on week days and between 12h to midnight. On average, in our center during this period, emergency physicians worked 38 hours per week.

As the MBI score can be broken down into the number of components of severe burnout present (on a 0 to 3 scale), we also calculated the sum total number of components of high burnout among emergency physicians present each day. A score for “emotional exhaustion” higher than 27, “depersonalization” higher than 13 and “personal accomplishment” lower than 30 were defined as a high burnout component. We then created a dichotomous variable “burnout day” that was positive if the sum of the components of severe burnout was superior to the number of physicians working that day (i.e. a more than 1 component of burnout per physician). Emergency physicians were also surveyed for their level of anxiety with the trait part of the Spielberger Trait Anxiety Inventory tool,<sup>22</sup> and screened for depression using Beck depression inventory score.<sup>23</sup>

## **Statistical analysis**

Categorical variables were expressed as number (percentage), continuous variables as mean  $\pm$  SD or median (interquartile range IQR) if necessary. Univariate analyses were performed to find variables associated to the primary endpoint. To assess independent predictors of an exceeded WT, we built a backward stepwise multivariate logistic regression model. We selected variables of the model *a priori* based on clinical relevance and previous studies, namely age older than 75 years, relative occupancy of the ED, trauma, severity triage, day of the week and time of the day.<sup>13</sup> In order to explore the association between the level of burnout and the outcome, we included in the model the mean burnout level of physicians working that day in the ED as a dichotomous variable (higher or lower than the median). Adjusted odds ratios (OR) and their 95% confidence intervals (IC) were calculated, and we assessed the best discrimination of the model with the area under the receiving operator characteristic curve (c statistic). We explored any collinearity between variables and excluded them in case of a  $r^2 > 0.6$ . Starting from the full model, we removed variables with non-significant association. We used likelihood ratio test to assess the goodness of fit of the model, and we also checked the Akaike's criterion.

As there is no validated threshold or cutoff to characterize the global burnout of the physicians working a given day, we planned several exploratory analyses with the use of different thresholds for the mean burnout level of the day (the 1<sup>st</sup> 2<sup>nd</sup> and 3<sup>rd</sup> quartiles) and the sum of components of the MBI score in burnout (ranging from 0 to 3 for each physician). Since three physicians refused to respond to the survey, we assigned them the highest score of burnout from surveyed physicians, and planned to perform a sensitivity analysis with the median burnout score instead.

P values <0.05 were considered to denote statistically significant differences. Analyses were performed with STATA software (release 13; Stata Corp., College Station, TX).

### **Sample size calculation**

We aimed to report an independent association of burnout with higher rate of exceeded WT. We made the hypothesis that 55% of patients will meet the primary endpoint, as we previously described.<sup>13</sup> With a power of 90% and an alpha of 0.05, we needed to analyze 4700 patients to report an adjusted OR of at least 1.1, which we considered the minimal clinically significant effect (PASS 14, NCSS, LLC. Kaysville, UT).

### **Results**

During the study period, we retrieved 24,317 ED visits after exclusion of dental related ED visits. Among these, 5,521 patients were excluded because of missing data on their WT (mostly patients that attended the ED for scheduled consultations or who left without being seen), and 750 with severity triage level 1. Finally, 550 patients were excluded as they were referred to the ED for a specialist consultation (maxillo-facial or psychiatric). We included in our analysis 17,496 ED visits, 12,807 in the main ED and 4,689 in the fast track unit (Fig. 1).

Among the 26 senior emergency physicians that work in our center, three declined to participate in the study. Median age of the responders was 34 years. Nine physicians (39%) exhibited at least one component of the MBI consistent with severe burnout. Median burnout score was 35 (IQR 24 – 49), and other characteristics are summarized in table 1.

In the main ED, the median WT was 63 min (IQR 36 – 105), and 56 min (IQR 33 – 88) in the fast track unit. Regarding our primary endpoint, 7,524 (59%) patients exceeded their target WT in the main ED, and 2,124 (45%) of patients in the fast track unit waited more than one hour. The results of the univariate analysis on factors associated with an exceeded target WT are reported in table 2. The burnout level of physicians working on a given day was an independent predictor of exceeded target WT, with an OR of 1.53 (95% CI 1.38 to 1.69) for a mean score of the day higher than 35. We also report that an age older than 75 years, an ED visit after midday, the severity triage scale and the daily occupancy were independent predictors for exceeded target WT, whereas a visit on Sunday or a trauma related visit were associated with a lower risk of an exceeded target WT (table 3). The c statistic of the model was 0.74 (95%CI 0.74 to 0.75).

As there is no unequivocal definition of a high burnout level in the ED, we ran several sensitivity analyses with different thresholds for this dependent variable, and also considering the number of components of severe burnout. We report the same effect in those analyses, with even a “dose – dependent” effect, as summarized in table 4.

In the fast track unit, along with daily occupancy, the level of burnout was the only factor associated with a prolonged WT in the adjusted multivariate model. Adjusted ORs are reported in table 5 for patients triaged in the fast track unit.

## **Discussion**

WT in the ED is often collected as a key quality indicator, and increased WT is reported to be associated with poor satisfaction, occurrence of adverse events and worsened outcomes.<sup>8,10,24,25</sup> As burnout syndrome may cause a decreased productivity among workers, we investigated whether it is associated with longer WT

for patients. In our study, we found that a high burnout level in emergency physicians working a given day was independently associated with a greater risk for an exceeded target WT (OR 1.53, 95%CI [1.38 to 1.69])

This is the first study examining the influence of burnout amongst emergency physicians on patient care. Several predictors of prolonged WT have been reported such as age of the patient, severity, busyness of the ED, day of the week and time of the day and we confirmed these results in our study.<sup>13,14</sup> However, previous studies have not investigated the influence of the provider on WT, but rather only variables at the patient or the ED level. The association between burnout level of physicians and patient outcomes has rarely been investigated, and evidence of consequences of severe burnout for patients care are scarce. Some studies have investigated increased risk of medical errors or lack of adherence to practice standards among physicians with burnout, however the impact on patients was not considered.<sup>26,27</sup> To our knowledge, only one study tried to provide a link between staff burnout and patient safety: in their large prospective multicenter study, Garrouste-Orgeas et al. found no association between burnout and pre-specified medical errors or adverse events.<sup>28</sup>

We confirm in our sample of physicians that burnout is common in the ED with 39% presenting with at least one component of burnout. They did not however exhibit depressive symptoms nor strong anxiety. Emergency medicine is a specialty prone to burnout,<sup>3</sup> hence the importance of a potential association with worsened outcomes. The identification of predictors of prolonged WT is useful to characterize patient pathways, but the identification of factors that we can correct is more important. The fact that a high acuity level or a high occupation of the ED is associated with exceeded target WT may not help us to improve WT, when the wellbeing of a

physician is a condition that we can ameliorate and that could at the end improve patient care.

Of note, we confirm the result of our previous study, regarding age greater than 75 years being a predictor of prolonged WT.<sup>13</sup> We regret that our previously reported results were not followed by a change of behavior towards this frail population, in order to shorten their WT. On the contrary, Monday is no longer an independent predictor of exceeded WT. Following our previous study, we assigned a supplemental emergency physician on Mondays, hence the improvement in WT on this day.

The strength of our study is that we investigated for the first time the possible influence of the provider on WT, and that we report for the first time a direct independent association between burnout of the physician and patient outcome.

## **Limitations**

Our study presents some limitations. First, we do not know if the burnout level of physicians remained unchanged over time. We recruited patients over four months, and the burnout level of the physicians may have changed during this timeframe. Moreover, we cannot exclude the possibility that overcrowding of the ED may contribute to the burnout of the physicians, so the phenomena could interact. To limit these issues, we surveyed physicians in the middle of the recruitment period, with the assumption that it would remain unchanged 2 months before or after: MBI score has a good test-retest validity over a few weeks.<sup>21</sup> Second, we only analyzed data on physicians, and not on nurses. However, since we focused on the WT to see a physician, the influence of the nurses may be limited (excepted for the triage nurse). Third, we assessed the overall influence of burnout of the day, and did not

specifically analyze different periods during the day, for example 8:30 am to 6:30 pm, with the mean burnout of physicians working only in these hours. That would have been very difficult to interpret as our emergency physicians work in overlapping shifts (some physicians are working from noon to 9pm, 12 to 12, etc.). Fourth, three physicians refused to participate in the study. We assumed in our primary analysis that these physicians may have a high level of burnout, and we assigned to them the highest MBI score that we found in our sample. To evaluate this potential bias, we performed sensitivity analyses with a different MBI score for these physicians (median score) and found similar results. Fifth, our endpoint was a dichotomous endpoint and did not integrate the extent of the excess waiting time. Subsequently, patients with an exceeded waiting time of 1 minute or several hours will be in the same outcome category. Lastly, our study was performed in one center, so generalization may be subject to caution. These results should be tested in other settings, with another sample of physicians. Moreover, since our study was observational, we observed an association and cannot infer a causality link.

## **Conclusion**

In this prospective study, we found that burnout among emergency physicians working a given day is an independent predictor of a prolonged WT for patients visiting the ED that day. These results confirm the hypothesis that burnout of physicians may have negative effects on patients, and highlight the need for intervention to limit burnout among emergency physicians.

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Characteristics	n (%)
<b>Men</b>	14 (61)
<b>Women</b>	9 (39)
<b>Emotional exhaustion score, median (IQR)</b>	15 (8-24)
<b>Level of emotional exhaustion, n(%)</b>	
High	4 (17)
Medium	7 (30)
Low	12 (52)
<b>Depersonalization score, median (IQR)</b>	8 (6-13)
<b>Level of depersonalization</b>	
High	6 (26)
Medium	8 (35)
Low	9 (39)
<b>Personal accomplishment score, median (IQR)</b>	37 (33-40)
<b>Level of personal accomplishment</b>	
High	4 (17)
Medium	6 (26)
Low	13 (57)
<b>Components of MBI in burnout</b>	
0	14 (61)
1	5 (22)
2	3 (13)
3	1 (4)
<b>MBI score median (IQR)</b>	35 (24-49)
<b>Anxiety score*, median (IQR)</b>	38 (30-50)
<b>Depression score **</b>	3 (1-8)
<b>Level of depression</b>	
Moderate	6 (26)
no depression	17 (73)

**Table 1: senior emergency physicians characteristics.** IQR: interquartile range. MBI: Maslach Burnout Inventory. \*Measured with the the Spielberger Trait Anxiety Inventory tool \*\*Measured with the Beck depression inventory.

Characteristics	All patients, n(%)	Seen within Target WT, %	Exceeded Target WT, %	Univariate analysis OR 95% CI
<b>All patients, n (%)</b>	12 807	5 283 (41)	7 524 (58)	
<b>Sex</b>				
Male	7 015 (55)	57	53	1
Female	5 792 (45)	43	47	1.15 (1.07-1.24)
<b>Age, y mean <math>\pm</math>sd</b>	49.95 $\pm$ 21.38			
<b>Age, years, median (IQR)</b>	48 (31-67)	44 (29-60)	52 (33-70)	
<b>Age&lt;75</b>	10702 (84)	89	80	1
<b>Age<math>\geq</math>75</b>	2105 (16)	11	20	2.07 (1.87-2.30)
Relative daily occupancy		0,98 (0,91-1,1)	1 (0,95-1,1)	
<b>Relative daily occupancy</b>				
<1	6251 (47)	56	44	1
$\geq$ 1	6974 (53)	44	56	1.64 (1.57-1.74)
<b>Severity triage</b>				
2 (TWT=20 min)	2715 (21)	11	29	1
3 (TWT=60 min)	7869 (61)	57	65	0.43 (0.39-0.47)
4 TWT=120 min)	2223 (17)	33	6	0.07 (0.06-0.09)
<b>Trauma patients</b>	2720 (21)	26	18	0.64 (0.59-0.69)
<b>Waiting time (min), median (IQR)</b>	63 (36-105)	39 (21-54)	92 (64-137)	
<b>Visit between 12h-00h</b>	6607 (52)	38	61	2.65 (2.47-2.85)
<b>Day of the week</b>				
Tuesday-Saturday	9270 (72)	69	74	1
Sunday	1546 (12)	16	9	0.55 (0.49-0.61)
Monday	1991(16)	15	16	0.96 (0.87-1.1)

**Table 2:** Patients characteristics. SD: standard deviation. IQR: interquartile range.TWT: target waiting time

Multivariate model	Adjusted OR 95% CI	p-value
<b>Burnout score &gt; 35 vs. ≤35</b>	1.53 (1.38-1.69)	<0.001
<b>Age&lt;75 years</b>	1	
<b>Age≥75 years</b>	1.48 (1.33-1.66)	<0.001
<b>Relative daily occupancy</b>		
<1	1	
≥1	1.63 (1.49-1.77)	<0.001
<b>Severity triage</b>		
2 TWT=20 min	1	
3 TWT=60 min	0.43 (0.39-0.48)	<0.001
4 TWT=120 min	0.09 (0.08-0.11)	<0.001
<b>Trauma patients</b>	0.75 (0.68-0.82)	<0.001
<b>Visit between 12h-00h</b>	2.05 (1.89-2.21)	<0.001
<b>Sunday</b>	0.62 (0.55-0.71)	<0.001

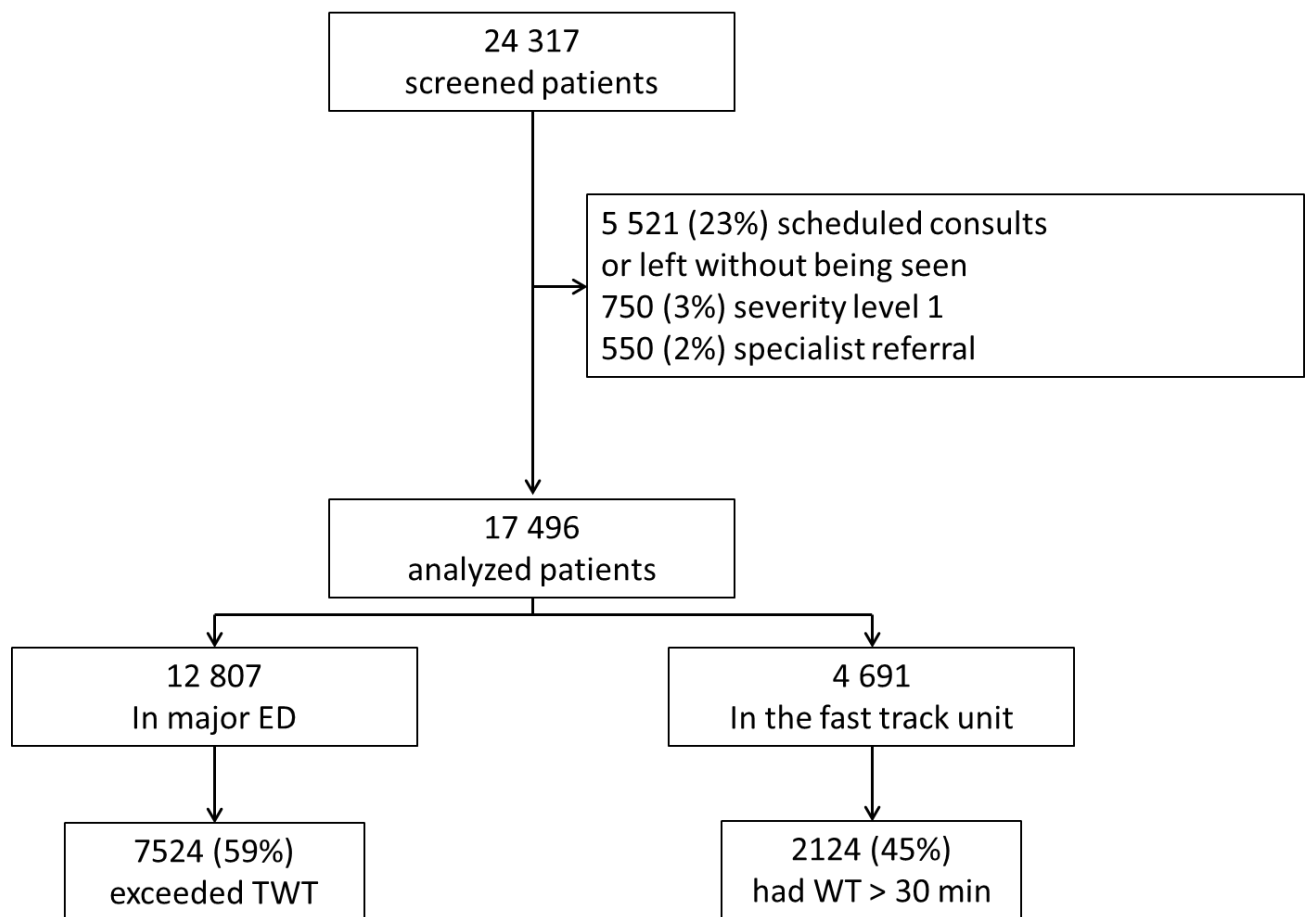
**Table 3:** Multivariate regression model in the main ED. TWT: target waiting time. C statistic = 0.74

Variable taken	Adjusted OR	95% CI
<b>Model 1 for missing values</b>		
<b>MBI score (per point continuous)</b>	1.02	(1.01 - 1.03)
<b>MBI score in 4 classes</b>		
<24	1	
25-35	1.35	(0.89 – 2.04)
35-49	1.96	(1.32 - 2.93)
>49	2.23	(1.48 - 3.36)
<b>number of MBI component in burnout</b>		
more than one in mean	1.51	(1.37 - 1.67)
<b>Model 2 for missing values</b>		
<b>MBI score (per point continuous)</b>	1.02	(1.01 - 1.02)
<b>MBI score</b>		
<35	1	
> 35	1.15	(1.01 - 1.24)
<b>number of MBI component in burnout</b>		
more than one in mean	1.08	(1.00 - 1.17)

**Table 4:** Exploratory analyses. Model 1: non responders were assigned with the highest score of burnout (77). Model 2: non responders were assigned with the median score of burnout (35). MBI: Maslach Burnout Inventory. OR: Odds Ratio.

Multivariate model	Adjusted OR 95%CI	p-value
<b>MBI score</b>		
≤24	1	
>24 & ≤35	2.31 (1.70 – 3.14)	<0.0001
>35 & ≤49	0.96 (0.72 – 1.26)	0.75
>48	2.41 (1.82-3.17)	<0.0001
<b>Relative daily occupancy</b>		
<1	1	
≥1	1.71 (1.51-1.94)	<0.0001
<b>Sunday</b>	0.60 (0.49-0.73)	<0.0001

**Table 5:** Multivariate regression model in the fast track unit. MBI: Maslach Burnout Inventory. OR: Odds Ratio.



**Figure 1:** Flowchart. ED: emergency department. WT: waiting time. TWT: target waiting time.