Hospital-integrated general practice: a promising way to manage walk-in patients in emergency departments

Mathyas Wang MD,1 Stefanie Wild BMed,2 Gabriela Hilfiker BMed,2 Corinne Chmiel MD,3,7 Patrick Sidler MD,6 Klaus Eichler MD MPH,8 Thomas Rosemann MD PhD4 and Oliver Senn MD MPH5

1General Practitioner, 2Research Assistant, 3General Internist and Researcher, 4Professor, 5General Internist and Senior Researcher, Institute of General Practice and Health Services Research, University of Zurich, Zurich, Switzerland
6Emergency Physician, 7General Internist and Researcher, City Hospital Waid, Zurich, Switzerland
8Senior Researcher, Institute of Health Economics, Zurich University of Applied Sciences, Winterthur, Switzerland

Keywords
emergency care, implementation, out-of-hours care, primary care, self-referral, walk-in patients

Abstract

Rationale, aims and objectives The inappropriate use and overcrowding of emergency departments (EDs) by walk-in patients are well-known problems in many countries. The current study aimed to determine whether ambulatory walk-in patients could be treated more efficiently in a new hospital-integrated general practice (HGP) for emergency care services compared to a traditional ED.

Methods We conducted a pre-post comparison before and after the implementation of a new HGP. Participants were walk-in patients attending the ED of a city hospital in Zurich. Main outcome measures were differences in total process time, time intervals between stages of care and diagnostic resources used.

Results The median process time from admission to discharge was 120 minutes in the ED (interquartile range: 80–165) versus 60 minutes in the HGP (IQR: 40–90) (P < 0.001). The adjusted odds ratio of receiving any additional diagnostics was 1.86 (95% confidence interval 1.06–3.27; P = 0.032) for ED doctors versus general practitioners (GPs) when controlling for patients’ age, sex and injury-related medical problems.

Conclusion The HGP is an efficient way to manage walk-in patients with regard to process time and utilization of additional diagnostic resources. The involvement of GPs in the HGPs should be considered as a promising model to overcome the inappropriate use of resources in EDs for walk-in patients who can be treated by ambulatory care.

Introduction

Emergency departments (EDs) in many developed countries are faced with increasing numbers of patients seeking medical help [1–6]. This leads to overcrowding of EDs with potential consequences that compromise patient access to care and the quality of care provided [1,2]. Several studies showed that the EDs are inappropriately frequented due to a high rate of walk-in patients (self-referrals) and that the vast majority of these patients could be treated in an outpatient setting by a general practitioner (GP), and hospitalization was rarely necessary [7–10]. Patients in Switzerland have direct, unlimited access to primary care physicians in an ambulatory care setting and free access to outpatient specialist treatment unless they are insured by managed care organizations with gatekeeping systems (currently <10% of the population) [7]. However, the access to hospital-based EDs is not restricted by a gatekeeping system and non-health-related factors often affect decisions whether patients seek care in an ED or with their GP [11–13]. Therefore, EDs seem to be used by patients as a substitute for GPs, especially in urban areas and during out of GPs’ office hours.

In Switzerland, over 50% of ED patients were walk-ins and the amount of emergency medical visits increased with annual growth rates of 1.5–6% in the 1990s [3,7]. Data from annual reports of a representative city hospital in Zurich, Switzerland (City Hospital Waid), indicate a further increase for the most recent time periods between 2005 and 2008, reaching annual growth rates of almost 7%. This has led many hospitals and health care authorities to implement new emergency care models to overcome the inappropriate use of the EDs and to improve cost-effectiveness. One increasingly popular model in Switzerland is a hospital-integrated general practice for emergency care services (HGP) with point-of-care diagnostics based on a team of GPs and emergency doctors supported by practice assistants. These HGPs are located within the hospitals and share certain infrastructure with the ED (e.g. administrative staff, X-ray), but are otherwise very similar to a primary care practice with regard to the organizational structure and diagnostic possibilities offered.
The aim of this study was to determine whether walk-in patients with ambulatory care could be treated more efficiently after implementation of the new HGP (new emergency care model) than before the implementation (traditional emergency care model) in terms of shorter process time and fewer additional diagnostic tests.

**Methods**

**Study design**

We conducted a pre-post comparative study before and after implementation of a new hospital-integrated general practice for emergency care services in a city hospital.

**Setting, intervention and participants**

The study was conducted at the ED of the City Hospital Waid in Zurich, Switzerland, with a catchment population of 180 000 people. Patient recruitment in the traditional and the new emergency care model is depicted in Fig. 1.

**Traditional emergency care model**

Patients were recruited consecutively among all patients admitted to the ED from 1 October 2007 to 12 November 2007. These patients were all treated in the traditional ED regardless of disease severity. One thousand fifty-five patients were enrolled during this period. Of these, 570 were classified as walk-ins, defined as no prior contact with medical professionals before admission. After exclusion of patients who could not be treated by outpatient care, 451 (walk-ins with ambulatory care) were eligible for the analysis. The emergency staff consisted of resident doctors and attending doctors in a supervising function.

**New emergency care model**

Within the hospital, a general practice (HGP) has been implemented, sharing infrastructure, administrative staff and medical supervision with the ED. The new HGP was implemented in March 2009. Patients who came to the hospital ED were triaged by an emergency nurse using the ‘emergency severity index’ (ESI) score ranging from 1 (life-threatening) to 5 (least severe) [14]. Patients with an ESI score of ≥4 (no immediate life-saving intervention and no or only one resource needed, e.g. laboratory test) were routed to the HGP. Patients were recruited consecutively among all patients admitted to the HGP from 6 April 2010 to 14 May 2010. Five hundred seventy-nine patients were enrolled during this period. Of these, 357 were classified as walk-ins. After exclusion of patients who could not be treated by outpatient care in the HGP, 342 (walk-ins with ambulatory care) were eligible for the analysis.

During weekdays from 0900 until 1700 h, an experienced (general internal medicine) resident doctor from the emergency medicine staff was on duty in the HGP. During weekdays from 1700 until 2230 h and during weekends from 1000 until 2230 h, a GP was on duty.

**Data collection and processing**

Data sheets on time intervals between predefined stages of care, source of referral, diagnostic interventions and mode of discharge after ED/HGP care were collected by different staff members directly involved in patient care with a validated outcome tool (emerge) to assess clinical performance in emergency care [7]. The ‘Verein Outcome’, a professional, non-for-profit data processing company responsible for quality control measurements in health care, provided comprehensive additional support to ensure data quality. This support included recurrent training in data collection for hospital staff before measurements, a manual describing the indicators and the data collection procedure, answering frequently asked questions, hotline support during measurement phases and data controlling. Processing of the raw data was performed by ‘Verein Outcome’.

In the HGP, discharge diagnoses of all patients were classified according to the International Classification of Primary Care, Second Edition (ICPC-2) system, a validated classification system.
of medical problems in primary care [15]. In the ED, a random sample of 15.5% of the walk-ins with ambulatory care (n = 70) was coded according to the ICPC-2 classification. Data were checked for eligibility, completeness and a set of predefined plausibility tests. These included checks for contradicting data, duplicate information and plausibility of time measurements.

Approval for research involving human data was given by the responsible ethics committee of the Canton of Zurich (Reference No. 26/09) and was carried out in compliance with the Helsinki Declaration.

Outcome measures

Primary outcome measures were process time (time from admission to discharge) and utilization of additional diagnostic resources. Secondary outcome measures were time intervals between different stages of care and type and number of additional diagnostic resources ordered.

Data analysis

Continuous variables were summarized as medians/interquartile ranges (IQRs) and categorical variables as frequencies. Non-parametric tests (chi-square and Wilcoxon rank-sum tests) were used to compare patient characteristics, time intervals and utilization of additional diagnostic tests between the two emergency care models. Stratification and regression analysis were applied to control for potential confounding. The level of significance was set at 0.05. Statistical analyses were carried out using STATA statistical program (version 11.1, Stata Corporation, College Station, TX, USA). Reliability of the ICPC coding was assessed by the kappa statistics. Corresponding agreements for the various ICPC levels resulted in high Cohen’s kappa coefficients ranging from 0.88 (specific rubric level) to 0.96 (chapter level).

Results

Patients

A total of 570 patients in the ED group and 357 patients in the HGP group were classified as walk-in patients during the respective study period. Thereof, 451 (79.1%) and 342 (96.1%) patients could be treated by ambulatory care in the ED and HGP, respectively. There were significantly more male patients (ED: n = 250, 55.4% versus HGP: n = 161, 47.1%; P = 0.02) in the ED group compared to the HGP group. The median age was not significantly different between both groups (ED: 35 years, IQR: 25–52 versus HGP: 36.5 years, IQR: 25–49; P = 0.854).

In the subset of ED patients having an ICPC classification (n = 70), a comparison was possible on a component level (i.e. injury versus non-injury-related problems). Significantly more injury-related medical problems (ED: n = 32, 45.7% versus HGP: n = 102, 29.9%; P = 0.01) could be shown in the ED group.

Process time and time intervals between the different stages of care

The median total process time (time from admission to discharge) and time intervals between the different stages of care are shown in Fig. 2.

The time from admission to first nursing activity in the ED (7 minutes, IQR: 5–14) and the comparable first contact with practice assistant in the HGP (5 minutes, IQR: 3–6), respectively, was statistically significant (< 0.001); however, the absolute difference was only 2 minutes. The median time from admission to first assessment by the doctor was not significantly different between the two emergency care models (ED: 25 minutes, IQR: 15–37 versus HGP: 25 minutes, IQR: 15–45; P = 0.065).

The median time from admission to communication of the diagnosis to the patients was significantly shorter in the HGP (50 minutes, IQR: 33–81) compared to the ED (85 minutes, IQR: 50–126) (< 0.001).

Finally, the median difference in process time halved in the new model (ED: 120 minutes, IQR: 80–165 versus HGP: 60 minutes, IQR: 40–90; P < 0.001). The time from admission to discharge remained 57.5 (95% CI: 49.3–65.7; P < 0.001) minutes shorter for self-referring patients treated in the new emergency care model, when controlled for injury-related problems, diagnostics used, age and sex by multiple regression analysis.

Table 1 shows the process time stratified according to injury cases, any diagnostic tests, laboratory tests and X-rays. All

© 2013 John Wiley & Sons Ltd
Table 1 Stratified process time from admission to discharge of walk-in patients with ambulatory care according to the emergency care model.

<table>
<thead>
<tr>
<th>Process time (minutes)</th>
<th>ED median (IQR)</th>
<th>HGP median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>120 (80–165)</td>
<td>60 (40–90)*</td>
</tr>
<tr>
<td>Stratified according to additional diagnostic tests:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With any tests</td>
<td>140 (95–185)</td>
<td>75 (50–109)*</td>
</tr>
<tr>
<td>Without any tests</td>
<td>70 (53–118)</td>
<td>50 (35–67)*</td>
</tr>
<tr>
<td>With laboratory</td>
<td>155 (118–213)</td>
<td>75 (50–105)*</td>
</tr>
<tr>
<td>Without laboratory</td>
<td>95 (66–140)</td>
<td>55 (38–80)*</td>
</tr>
<tr>
<td>With x-ray</td>
<td>120 (87–165)</td>
<td>65 (55–116)*</td>
</tr>
<tr>
<td>Without x-ray</td>
<td>115 (65–165)</td>
<td>55 (40–80)*</td>
</tr>
<tr>
<td>Stratified according to injury-related problems:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury related</td>
<td>113 (83–164)</td>
<td>63 (45–108)*</td>
</tr>
<tr>
<td>Non-injury related</td>
<td>117 (76–165)</td>
<td>60 (40–89)*</td>
</tr>
</tbody>
</table>

*P < 0.001 for between-group comparison (ED versus HGP).

Stratified according to ICPC-2 chapter (injury versus non-injury). In the ED group, only a random sample of patients with ICPC classification represented (injury-related subgroup n = 32; non-injury-related subgroup n = 38).

ED, emergency department; HGP, hospital-integrated general practice for emergency care services; ICPC-2, International Classification of Primary Care, Second Edition; IQR, interquartile range.

Stratified subgroups showed a significant difference in terms of shorter process time in the HGP compared to the ED (P < 0.001). During the time period when GPs were on duty in the HGP, the median process time was 58 minutes (IQR: 40–81) versus 65 minutes (IQR: 40–108) when an experienced resident doctor was on duty (P = 0.035). Compared to the old ED model, the observed process time remained significantly shorter in the HGP when the analysis was restricted to the residents’ duty periods (P < 0.001).

Additional diagnostic resources

Comparisons of additional diagnostic examinations between the ED doctors and the HGP doctors (i.e., GPs and residents) are graphically displayed in Fig. 3. Overall, additional diagnostic resources were used for 70.5% of patients in the traditional ED versus 55.6% in the new HGP (i.e., GPs and residents together) (P < 0.001). The difference between ED and HGP was related to the significantly lower diagnostic examinations ordered by the GPs in comparison to the residents in the HGP and the ED doctors. To control for a potential confounding due to injury-related problems and patients’ age and sex, we performed a multiple logistic regression. The adjusted odds ratios for patients receiving any additional diagnostics were 2.14 (95% confidence interval 1.34–3.42; P = 0.002) for residents versus GPs and 1.86 (1.06–3.27; P = 0.033) for ED doctors versus GPs. Residents in the HGP did not differ with regard to the use of diagnostics compared to the ED group (adjusted odds ratio 0.87, P = 0.66).

The additional diagnostic resources used for these patients are shown in Table 2. Overall, there was a significant difference between the two groups with regard to additional diagnostic resources ordered (P < 0.001). Laboratory and X-rays were the two most commonly ordered diagnostic tests in both groups.

Discussion

Our study compared the efficiency between a traditional ED and a new HGP on the management of walk-in patients. It was carried out prospectively with a before and after intervention design in a real emergency care setting, with emphasis on walk-in patients with ambulatory care, representing a majority of the patients managed in the new HGP (96.1%).

The new emergency care model turned out to be considerably more efficient in terms of shorter process time (halved from 120 to 60 minutes) and in terms of utilization of fewer diagnostic resources (reduced from 70.5 to 55.6%). The shorter process time

Table 2 Type and number of additional diagnostic resources ordered for walk-in patients with ambulatory care according to the emergency care model.

<table>
<thead>
<tr>
<th>Emergency care model</th>
<th>ED*, n (%)</th>
<th>HGP, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>161 (50.6)</td>
<td>116 (61.1)</td>
</tr>
<tr>
<td>X-ray</td>
<td>191 (60.1)</td>
<td>71 (37.4)</td>
</tr>
<tr>
<td>Specialist consultation</td>
<td>11 (3.5)</td>
<td>19 (10.0)</td>
</tr>
<tr>
<td>ECG</td>
<td>31 (9.8)</td>
<td>13 (6.8)</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>14 (4.4)</td>
<td>7 (3.7)</td>
</tr>
<tr>
<td>Other</td>
<td>15 (4.7)</td>
<td>14 (7.4)</td>
</tr>
</tbody>
</table>

Other: e.g. pulmonary function test, computer tomography, magnetic resonance imaging, etc. Total >100% because of multiple responses. *P < 0.001 for between group comparison (ED vs HGP). ECG, electrocardiography; ED, emergency department; HGP, hospital-integrated general practice for emergency care services.
remained significantly shorter after stratification into subgroups. These results after stratification show that neither the involvement of GPs (more experienced than residents) nor a difference in casemix (injury versus non-injury) nor the usage of more diagnostic tests alone, but rather the system change as a whole focusing on the specific emergency needs for walk-in patients, accounts for the positive effects shown in our study. Possible factors contributing to the shorter process time in the HGP except for utilization of fewer diagnostic resources could be point-of-care laboratory diagnostics (POC) and less administrative paperwork. The impact of POC on reducing ED patient processing times has been recently demonstrated in a randomized controlled trial [16]. A preliminary analysis 6 months after the implementation of the HGP showed similar trends in the time intervals as we could demonstrate after 1 year (data not presented). Therefore, it can be concluded that the positive effects shown in our study are persistent and not only temporary. Due to the single-centre nature of the study, generalizability of the results might be questionable. The study site took part in the evaluation study of our data collection tool ‘emerge’, including 12 EDs of community hospitals in Switzerland [7]. The baseline data of the current study (Fig. 1) revealed a self-referral rate at the ED of 54% (year 2007), which is slightly higher compared to the observed self-referral rate of the validation study (50.6% in the year 2002), suggesting a similar (increasing) burden of self-referrals compared to the other 11 participating EDs in Switzerland. In addition, patients’ characteristics of the self-referrals presenting at the ED with regard to age, gender and medical problems at our study site were comparable to Moll van Charante et al. [17] investigating walk-in patients seeking treatment at three different EDs in the Netherlands. Thus, our baseline data can be considered representative at least of other community hospitals in Switzerland.

Shorter process times have been demonstrated in a recent Dutch study where GPs were added to the usual staff of the ED to treat walk-in patients [18]. Our results are also in line with a recent Swiss study showing shorter consultation time in patients treated by the GP compared to the ED staff [19]. However, these studies did not assess detailed time intervals between different stages of care and, in the latter process time, were restricted to ear, nose and throat emergency cases.

It is known that the use of diagnostic in an ED is higher than in GP cooperatives, even the reasons are not completely clear [20]. We could confirm this finding by showing a reduction of the utilization of diagnostic resources in the HGP compared to the ED. However, this decrease in diagnostic resources was mainly related to the GPs on duty in the HGP and could not be demonstrated for the residents in the HGP. Our observed difference in diagnostic resources is in line with the previously reported significant decreases in additional examinations due to the involvement of GPs in the ED [18,21,22]. We did not assess elements that contributed to this different behaviour between GPs, residents and ED doctors. It can be assumed that professional experiences, dealing with diagnostic uncertainty and adherence to clinical practice guidelines, are at least in part responsible for the observed differences.

In most of the studies evaluating the impact of GPs on waiting time and resource utilization in self-attending patients, GPs were part of the ED staff working within the ED. This differs from our HGP, which is an institution located within the hospital with shared infrastructure but separated spatially from the ED and staffed with both GPs and (general internal medicine) residents. As demonstrated in our study, regardless of the doctor on duty in the HGP (GPs or residents), patients in the HGP group could be treated faster compared to the ED group. Within the HGP, GPs treated patients significantly faster with utilization of fewer diagnostic resources compared to the residents. Therefore, we suppose that the HGP as a whole contributes supplemental effects in addition to the effects contributed by GPs working as an integral part of the ED, as shown in the previous studies.

To our knowledge, so far, only one Dutch study investigated the effectiveness of a hospital-integrated general practice, termed ‘integrated emergency post’ [23]. They could show a decrease in waiting/consultation time with no difference in patient satisfaction compared to the care provided in the ED. However, most patients were seen by nurse practitioners rather than by doctors and the effect on utilization of additional diagnostic resources was not assessed. Besides time and diagnostic resources, there are many other important aspects to consider in evaluating the efficiency of new emergency care models, such as patient and doctor satisfaction, quality of care and costs. A variety of organizational models are used for providing out-of-hours care in Western countries, each of them having potential strengths and weaknesses [24]. Similar to our model, integration and extensive collaboration between GP cooperatives and the ED of hospitals, in which GPs take care for self-referring patients, has been considered as an important development for after-hours primary care in the Netherlands [25]. Results from the Maastricht integrated out-of hours service showed a successful shift in patient flow from the ED to primary care after the establishment of a primary care physician cooperative integrated with the ED [26,27]. A report by the Belgian Health Care Knowledge Center [28] recommended that different solutions have to be combined to solve the problem of after-hours care taking into account the local situations. Out-of-hours care was traditionally organized by a rota group system in the catchment area of the ED in the current study. A previous survey showed that 56.6% of the involved GPs were dissatisfied with the current out-of-hours service [29]. Models involving GPs in the ED have been shown to be associated with high levels of satisfaction for patients [18,30] and with reduced costs [30]. The GP satisfaction in other countries after setting up a new emergency care model is mixed but usually positive [28].

A limitation of our study was the lack of follow-up of patient outcomes; therefore, it was not possible to demonstrate if the quality of care provided to the walk-in patients was comparable in both groups. We cannot exclude whether the observed decrease in diagnostic examinations by GPs might be related to an increased risk of incorrect diagnoses. However, previous studies with GPs involved in the ED did not find evidence of a decrease in quality of care in terms of incorrect diagnoses [18] and in the use of a GP 7–10 days after ED attendance [30]. Furthermore, long waiting times can alter the behaviour of both staff and patients and lead to potentially adverse consequences. The risk of adverse events in low-acuity patients who were well enough to leave the ED increased with the mean length of stay in the ED [31]. Another limitation is the data collection during different seasons (October–November 2007 versus April–May 2010) which might introduce a certain disease selection bias. The randomly selected sample of ED patients with an ICPC classification...
did however allow performing a stratified analysis according to injury-related problems in a representative subsample. Furthermore, our analysis was restricted to self-referrals consecutively treated by ambulatory care and additionally controlled by regression modelling. Our inclusion criteria and the fact that patients self-referring to an ED mainly present with non-urgent complaints [32] suggest that the observed differences between the traditional and the new emergency care model cannot be explained only by differences in the patient population. The slightly decreased number of walk-in patients suitable for ambulatory care after the implementation of the new model is probably explained by a shorter patient recruiting period, including eastern vacation and does not reflect an increased burden of walk-ins somewhere else in the emergency service district.

In summary, our study adds further evidence that an HGP can manage walk-in patients within a shorter time period. Furthermore, we could show a reduction of utilization of diagnostic resources in the HGP due to the involvement of GPs. In the context of the inappropriate use of EDs and the GP’s dissatisfaction with traditional out-of-hours care system, there is a pressure for reorganizing out-of-hours care. There is increasing evidence to support implementation of new models with GP involvement, such as our HGP, to overcome the overcrowding of EDs.

Conflict of interest statement
The authors declare that they have no competing interests.

Author contributions
MW was a study investigator, performed statistical analysis, interpreted data and drafted the manuscript. OS, TR, KE and CC developed the study protocol and were study investigators. PS, SW, GH and CC were responsible for data collection and organization of the evaluation periods at the ED and HGP. OS provided statistical advice on study design and analysed the data. MW and OS take responsibility for the paper as a whole.

Acknowledgements
We would like to thank Peter Imbach, MD, for his helpful comments and coordination of the HGP. Many thanks go to the staff of the ED and HGP at the City Hospital Waid for the very thorough data collection. We would like to express our gratitude towards ‘Verein Outcome’ for scanning and processing the data.

The following persons are members of the scientific board of the ongoing study who evaluated the implementation of the HGP in the City Hospital of Waid: Holger Auerbach, Urs Brügger, Klaus Eichler, Suscha Hess and Isabelle Rüthemann (Institute of Health Economics, Zurich University of Applied Sciences, Winterthur); Peter Rüesch (Center for Health Sciences, Department for Health Professions, Zurich University of Applied Sciences, Winterthur); Thomas Rosemann, Oliver Senn And Marco Zoller (Institute of General Practice, University of Zurich).

Funding
The study was supported by a project fund of the Health Department of the City of Zurich, Switzerland. The funding source had no influence on study design; on the collection, analysis and interpretation of the data; on the writing of the manuscript; and the decision to submit the manuscript for publication.

References


