

# Deck the halls with rows of trolleys ... emergency departments are busiest over the Christmas holiday period

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In recent years, there have been anecdotal reports of a sharp increase in demand for hospital emergency department (ED) services during the Christmas and New Year period in the New South Wales public health system (NSW is the most populous state in Australia with a population of 6.5 million<sup>1</sup>). There has been speculation that this has resulted from reduced availability of general practitioners during the holiday period. There is sparse literature on this phenomenon in Australia, except for a study of seven Sydney EDs that reported a small increase in low-acuity (“potential GP-type”) patients during the 2002–2003 holiday period.<sup>2</sup>

This phenomenon has been informally reported and debated overseas,<sup>3–10</sup> but, to our knowledge, has not been comprehensively quantified. In the northern hemisphere, the holiday season is reported to be associated with increased demand for hospital services for cardiac and respiratory illness and injuries.<sup>11–13</sup> The coincident influenza season may be an exacerbating factor in the northern hemisphere, but not in Australia.

We used routinely collected administrative data to assess changes in ED activity and ED visits that could have been managed by GPs during the holiday period.

## METHODS

We performed a retrospective descriptive and analytical study comparing ED visits in NSW during the Christmas and New Year period with visits in the remainder of the year from 15 January 2001 to 14 January 2006.

Data were obtained from the NSW ED Data Collection (EDDC), a database of patient management information entered routinely in most NSW urban and larger rural and regional public hospital EDs. The EDDC captures about three-quarters of all NSW ED visits.<sup>14</sup> It contains a deidentified record of every ED visit to participating hospitals, and includes data describing time milestones during the patient's transit through the ED, and the patient's age, sex, source of referral, mode of arrival, treatment acuity based on triage category, and discharge status.

## ABSTRACT

**Objectives:** To assess changes in emergency department (ED) activity and visits to EDs that could have been managed by general practitioners (GP-type visits) in the Christmas and New Year holiday period compared with the rest of the year.

**Design and setting:** Retrospective descriptive and analytical comparison of New South Wales ED visits in the holiday period and the rest of the year; data were obtained from the NSW Emergency Department Data Collection database for the period 2001 to early 2006. More detailed information in 2005–2006 allowed GP-type visits to be assessed in this period only.

**Main outcome measures:** The change in the number and percentage of weekly ED visits during the holiday period.

**Results:** Between 2001 and 2006, average weekly counts of ED visits increased by 9% (95% CI, 7%–11%) during the holiday period. The holiday increase was largely accounted for by visits that were less urgent, and for patients who were not admitted, did not arrive by ambulance, had a shorter treatment time and arrived between 08:00 and midnight. In 2005–2006, average weekly counts of GP-type visits increased by 21% (95% CI, 15%–28%) compared with 8% (95% CI, 4%–12%) for ED visits overall. However, GP-type visits accounted for only 39% of the additional holiday visits. GP-type visits increased mainly for adults and more in urban than rural areas.

**Conclusions:** The Christmas and New Year period is the busiest time of year for NSW EDs. However, only some of the additional holiday visits can be attributed to GP-type visits. Improving access to GPs, but also to broader hospital and community-based health care services over the holiday period, should be considered for managing the excess demand.

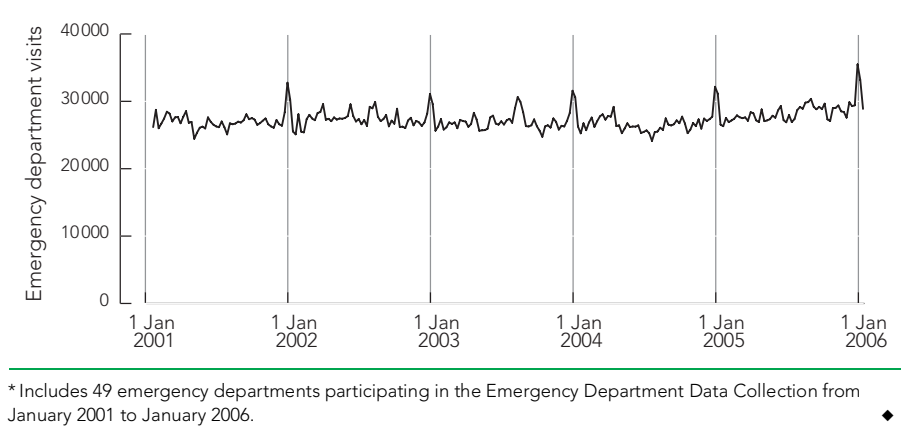
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We defined the Christmas and New Year period (“holiday period”) as the 28 days from 18 December to 14 January. The remainder of the year was defined as the “non-holiday period”. “More urgent” visits were those involving patients assigned a triage category<sup>15</sup> on presentation of 1 (immediately life-threatening), 2 (imminently life-threatening) or 3 (potentially life-threatening). “Less urgent” visits were those involving patients assigned triage category 4 (potentially serious) and 5 (less urgent). “Admitted” visits were those involving patients with a discharge status of admission to an inpatient ward, admitted and transferred to another hospital, died in the ED, or were dead on arrival (if recorded). “Non-admitted” visits were the remainder. Treatment time was defined as the interval between first being seen by a clinician after triage and being ready for discharge. Geographic locations of the EDs were grouped according to the Accessibility and Remoteness Index of Australia (ARIA),<sup>16</sup> which categorises each locality in

Australia based on road distance to certain levels of goods and services. We classified the locality of each ED into urban (ARIA categories: “highly accessible” and “accessible”) and rural (“moderately accessible”, “remote” and “very remote”) areas. “GP-type visits” were defined using the Australasian College for Emergency Medicine (ACEM) criteria,<sup>2</sup> and involved patients who: were self-referred; were assigned a less urgent triage category (4 or 5); did not arrive by ambulance; presented between 08:00 and midnight; had a treatment time of less than 60 minutes; and were subsequently discharged from the ED.

The outcome of interest was the change in the number and percentage of ED presentations during the holiday period relative to the non-holiday period by disposition (admitted or not admitted), triage category, mode of arrival, length of treatment time, arrival time and a composite GP-type visit category. GP-type visits were further analysed by age and urban or rural location of the ED.

### 1 Weekly counts of emergency department visits, 1 January 2001 to 14 January 2006\*



As our study used deidentified information from NSW Department of Health information systems, ethical approval was not required.

#### Statistical analysis

To compare ED activity in the holiday period with the non-holiday period, we used Poisson regression, appropriate for analysis of count data.<sup>17</sup> It has the advantage that the parameter estimates from the models can be easily converted by exponentiation into relative risk ratios, which in turn can be interpreted as a percentage change in the dependent variable (weekly counts of ED visits) when comparing one subgroup of the independent variable with the other (holiday versus non-holiday period). We also included a linear time trend in the model to account for long-term changes such as population size and natural growth in ED activity.

We used this technique to conduct a “short-term” and a “long-term” analysis:

**Short-term analysis:** Because source of referral data were largely incomplete before 2005, we could only apply the GP-type visit definition in the 1-year period ending 14 January 2006. This short-term analysis included 48 of the 61 available EDs in the EDDC with reasonably complete information in that period — 12 of the excluded hospitals were small to medium regional hospitals and one was an urban tertiary teaching hospital. This analysis also allowed assessment of GP-type visits by age and urban or rural location of the ED

**Long-term analysis:** All other characteristics could be assessed for 49 EDs over the full period January 2001 to January 2006. The excluded EDs in this analysis were 12 small

to medium rural EDs that did not participate in the EDDC for the entire 5 years.

There were 44 EDs common to both analyses.

All data items except source of referral were at least 95% complete. Source of referral, only used for the short-term analysis, was 99% complete in 2005–2006. In the short-term analysis, 92% of visits could be assigned to GP or non-GP-type visits. We were unable to include missing data within ED visit categories where it prevented a category being assigned, but all data were used in analyses of total visits.

All analyses were performed with SAS, version 8.02 (SAS Institute, Cary, NC, USA).

#### RESULTS

Between 2001 and early 2006, there were 7 163 497 visits to the 49 EDs. In each year, the highest weekly counts of visits occurred during the holiday period, and there was an overall upward trend in ED visits during 2005 (Box 1). The average weekly count during the holiday period was 2555 visits higher than that during the non-holiday period, representing an increase of 9% (95% CI, 7%–11%;  $P < 0.001$ ) after adjusting for linear time trend (Box 2). Visits involving patients who were not admitted, whose visits were less urgent, who did not arrive by ambulance, had a shorter treatment time and arrived between 08:00 and midnight and showed even greater increases during the holiday period relative to the non-holiday period.

There were 1 433 254 visits in the short-term analysis of 48 EDs from 15 January 2005 to 14 January 2006. Overall, about a fifth were GP-type, with the proportion of GP-type visits decreasing markedly with

age, and being much higher in rural areas (Box 2).

During the holiday period, there were an average additional 3494 visits each week to these 48 EDs, and 1353 additional GP-type visits (Box 2). Therefore, GP-type visits represented 39% of the additional visits. The proportion of GP-type visits during the holiday period (21%) was slightly higher than that of the non-holiday period (19%), and this pattern was evident in each age group, and in both urban and rural areas.

During the 2005–2006 holiday period, all visits increased by 8% (95% CI, 4%–12%;  $P < 0.001$ ) relative to the non-holiday period, and GP-type visits increased by 21% (95% CI, 15%–28%;  $P < 0.001$ ), after adjusting for long-term trend. Total weekly visits increased during the holiday period in both urban and rural areas and in all age groups, except children. Overall, paediatric visits declined as a result of a decline in non-GP-type paediatric visits. However, GP-type visits increased in all categories, including children, and this increase was greater than the increases in non GP-type and all visits in every category.

#### DISCUSSION

The holiday period was the busiest for NSW EDs, and the greatest increases were in visits with less urgent problems, those not requiring admission, and those with a relatively short treatment time. GP-type visits increased to a greater extent during the holiday season particularly among adults and in urban areas.

To our knowledge, this is the first formal study of the impact of the holiday season on ED activity. This study used routinely collected patient management information from a large number of EDs over several years. It also included a wide range of ED types, from large urban tertiary teaching hospitals to regional hospitals. It is therefore likely to be broadly representative of NSW ED activity. This study also provides valuable information on GP-type activity in EDs with wider relevance than previous, smaller studies.<sup>2,18,19</sup> We found that the proportion of GP-type visits was highest for children, and declined with patients' age. The proportion of GP-type activity in rural EDs was about twice that in urban EDs.

This study has some limitations. The administrative data used are collected by busy ED personnel during the course of their work. Recording practices may vary between EDs and may change over time. The volume of ED visits does not adequately

## 2 Average weekly counts of emergency department (ED) visits and percentage change in weekly counts in the holiday and non-holiday periods, by type of visit

		Average weekly visits*		Percentage change <sup>†</sup> (95% CI)	P
		Holiday period	Non-holiday period		
<b>Long-term analysis, 2001–2006 (49 EDs)</b>					
Disposition	Admitted	8 605 (29%)	8 681 (32%)	-1% (-2% to 1%)	0.294
	Not admitted	21 035 (71%)	18 408 (68%)	14% (12% to 17%)	< 0.001
Triage category	More urgent	11 099 (37%)	11 036 (41%)	1% (-2% to 3%)	0.618
	Less urgent	18 588 (63%)	16 096 (59%)	15% (13% to 18%)	< 0.001
Mode of arrival	Ambulance	6 420 (22%)	6 398 (24%)	0 (-1% to 2%)	0.692
	Non-ambulance	23 277 (78%)	20 744 (76%)	12% (10% to 15%)	< 0.001
Treatment time	> 60 minutes	17 476 (59%)	16 787 (62%)	4% (3% to 6%)	< 0.001
	≤ 60 minutes	10 697 (36%)	8 992 (33%)	19% (16% to 22%)	< 0.001
Arrival time	08:00–00:00	24 965 (84%)	23 095 (85%)	8% (6% to 10%)	< 0.001
	00:00–08:00	4 734 (16%)	4 049 (15%)	17% (14% to 20%)	< 0.001
<b>All visits</b>		<b>29 699</b>	<b>27 144</b>	<b>9% (7% to 11%)</b>	<b>&lt; 0.001</b>
<b>Short-term analysis, 2005–2006 (48 EDs)<sup>‡</sup></b>					
Patient age (years)					
0–15	GP-type	2 030 (30%)	1 704 (26%)	8% (0 to 16%)	0.042
	Non-GP-type	4 178 (63%)	4 395 (66%)	-16% (-23% to 8%)	< 0.001
	All	6 661 (22%)	6 609 (25%)	-9% (-16% to 0)	0.040
16–64	GP-type	3 744 (22%)	2 911 (20%)	25% (18% to 32%)	< 0.001
	Non-GP-type	12 123 (70%)	10 399 (71%)	9% (6% to 13%)	< 0.001
	All	17 325 (58%)	14 584 (56%)	15% (10% to 19%)	< 0.001
65 and over	GP-type	569 (10%)	375 (7%)	53% (38% to 70%)	< 0.001
	Non-GP-type	4 941 (87%)	4 439 (89%)	5% (1% to 8%)	0.010
	All	5 699 (19%)	5 001 (19%)	10% (6% to 14%)	< 0.001
Geographic location of EDs					
Urban	GP-type	2 889 (16%)	2 081 (13%)	29% (22% to 38%)	< 0.001
	Non-GP-type	13 245 (75%)	12 063 (77%)	2% (0 to 5%)	0.104
	All	17 176 (60%)	15 603 (60%)	8% (4% to 11%)	< 0.001
Rural	GP-type	3 455 (29%)	2 910 (27%)	15% (9% to 21%)	< 0.001
	Non-GP-type	8 001 (67%)	7 170 (68%)	3% (-1% to 6%)	0.121
	All	11 974 (40%)	10 593 (40%)	8% (5% to 12%)	< 0.001
All visits	GP-type	6 344 (21%)	4 991 (19%)	21% (15% to 28%)	< 0.001
	Non-GP-type	21 246 (72%)	19 234 (73%)	2% (0 to 5%)	0.093
	All	<b>29 690</b>	<b>26 196</b>	<b>8% (4% to 12%)</b>	<b>&lt; 0.001</b>

\* Counts of paired categories may not sum to the total because values were missing for some variables. † Adjusted for long-term trend. ‡ GP-type visits could only be categorised for the 2005–2006 period. ◆

measure ED workload, which is also affected by the severity and complexity of a patient's presenting illness, and hospital factors, such as availability of beds and other support services.

Another limitation is that we could not identify which patients could genuinely have been handled by GPs. Therefore, we had to use an indirect method of identifying these visits from the available data items. There is no generally agreed definition of ED

visits that could have been managed by GPs, and a number of definitions have been used.<sup>2,18–21</sup> One approach is based only on less urgent triage categories,<sup>21</sup> but this has been discredited because patients in these categories often require longer consultation time, more imaging and pathology tests, and have a much higher admission rate than patients seen in general practice.<sup>2</sup> They also have a substantial mortality rate after admission to the hospital.<sup>22</sup> Other studies have

identified common features of GP-type visits, including being self-referred, not arriving by ambulance, being assigned triage category 4 or 5, and being subsequently discharged from the ED.<sup>2,18,19</sup> The ACEM definition we used<sup>2</sup> was the most comprehensive available because it took into account the patient's time of presentation and total treatment time. However, this definition is still limited because the treatment time can be affected by the seniority of

treating clinicians, prevailing ED workload and turnaround time of investigations. Furthermore, the ED arrival time criterion makes no distinction between weekdays, weekends and public holidays, when GP availability could vary.

Our results suggest that ED workload during the holiday period is strongly sensitive to the supply of GP services. This is supported by the generally lower counts of GP consultations billable under Medicare in December and January.<sup>23</sup> However, GP-type visits accounted for only 39% of the overall additional holiday visits, so other explanations are required. One possibility is that the additional ED visits may result from a real increase in the incidence of disease and injury during the holiday period. Another possibility is that reduced services over the holiday period by other health care providers, including specialists, hospital outpatient services and community-based care programs, place more burden on EDs.

Future work could focus on validating definitions of GP-type ED visits, as well as exploring specific drivers of ED demand, such as seasonal disease and injury patterns, holiday travel-related demand factors, and determining the cost-effectiveness of maintaining alternative services, including those of GPs, throughout the holiday period.

## CONCLUSIONS

The Christmas and New Year holiday period is the busiest time of year for NSW EDs. We estimated that less than half of the additional visits could have been attributed to GP-type visits. While the cause of the remaining additional visits remains unknown, it is likely to be multifactorial and may include seasonal disease and injury patterns, and reduced availability of other health care services. To reduce the demand on EDs during the holiday period, strategies which improve access to GPs and other hospital and community-based health care services will need to be considered.

## COMPETING INTERESTS

We used administrative data routinely collected in the Emergency Department Data Collection

(EDDC) in New South Wales. EDDC is freely available to all employees working for the NSW Department of Health and Area Health Services. All authors work for NSW Health and we did this study during the course of our work. Therefore, we did not receive any funding to conduct this study.

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