Research Report

Characterising patients who did not wait (DNW) for treatment at a rural hospital emergency department– A retrospective cohort study

Study Investigators

Principal Investigator: Jenae O'Sullivan

Ph. 0410517795

Email: Jenae.O'Sullivan@health.nsw.gov.au

Investigator: Jenae O'Sullivan[1]

Associate Investigator (C): Professor Michael M Dinh[2]

1. Casino & District Memorial Hospital. Northern New South Wales Local Health District (NSWLHD)

2: Royal Prince Alfred Hospital (RPAH) Greenlight Institute, Sydney Local Health District (SLHD)

ACKNOWLEDGMENTS

Grateful acknowledgement is extended to the Green Light Institute, particularly Professor Michael Dinh, for the invaluable statistical support and expertise that contributed significantly to the analysis and interpretation of data. Special thanks to the Emergency Department staff and the Executive team at Casino & District Memorial Hospital for their collaboration and ongoing commitment to improving patient care. Sincere appreciation is also given to the Health Education and Training Institute (HETI) for their support and guidance through the Rural Research Capacity Building Program. Thanks are extended to the Northern NSW Local Health District for facilitating data access and enabling this research. Finally, heartfelt thanks to Professor Christina Aggar for her ongoing encouragement and support throughout the project.

TABLE OF CONTENTS

ABSTRACT

Objective:

To examine the characteristics of patients who did not wait (DNW) for treatment at a rural Australian Emergency Department (ED), and to identify the demographic, clinical, and temporal factors associated with increased risk of DNW using time-to-event analysis. This study aims to address the lack of rural-specific data in existing DNW literature and inform targeted interventions.

Methods:

A retrospective cohort study was conducted at Casino & District Memorial Hospital ED in Northern NSW. All patient presentations between 1 January and 31 December 2023 were included (n=13,913), with 11 exclusions due to registration errors. Data was extracted from electronic medical records and included demographics, triage category, arrival mode, presenting problem, time of arrival, Indigenous status, and ED length of stay. Cox proportional hazards regression was used to assess the association between patient characteristics and time to DNW.

Results:

During the 12 month study period, 5.9% of patients DNW for treatment. The median length of stay for DNW patients was 89 minutes (IQR: 44–155), indicating that most left within the first 1.5 hours of presentation. Patient characteristics that predicted DNW included being male (HR=1.19, 95%CI= 1.03-1.35, p = 0.01), aged 16–25 years (HR=1.42,95%CI= 1.06-1.92, p=0.02) identifying as Indigenous (HR=1.42, 95% CI= 1.21–1.66, p <0.0001, not being married (HR=1.23, 95%CI= 1.05-1.46, p=0.02), being triaged to Category 5 (HR=8.21, 95% CI: 6.21–10.86, p < 0.0001), presenting during the evening shift (HR = 1.41, 95% CI = 1.21–1.64, p < 0.0001), and having a history of frequent ED presentations (HR = 0.95, 95% CI = 0.78–1.16, p = 0.62).

Conclusion:

The study findings highlight a clear profile of patients at higher risk of leaving before receiving care, with both demographic and operational factors contributing to the likelihood and timing of DNW behaviour. in a rural Australian ED, highlighting the findings highlight key risk factors and the timing of patient departures, suggesting the need for tailored, rural-specific strategies—such as early triage interventions, improved waiting room engagement, and culturally safe care models—to reduce DNW rates and improve timely access to emergency care. The use of Cox regression adds a temporal dimension not commonly applied in DNW research and contributes novel evidence from a rural context where such data is lacking.

KEYWORDS

Did Not Wait
Walk outs
Left without being seen
Emergency department
Rural

EXECUTIVE SUMMARY

Background

Did Not Wait (DNW) presentations are a key indicator of emergency department (ED) performance, reflecting patient dissatisfaction, system delays, and inequities in access to care. Elevated DNW rates may compromise patient outcomes and indicate a breakdown in timely and effective care. This study aims to identify the factors associated with DNW in a rural emergency department (ED) in New South Wales, using local data to inform actionable, system-level improvements.

Study Design

A retrospective cohort study analysed all emergency department (ED) presentations (n = 13,913) between January and December 2023 at a rural hospital. Cox proportional hazards regression was used to model the time-dependent risk of DNW, while Kaplan-Meier curves illustrated variation in wait-time tolerance across patient groups.

Recommendations

Findings support the following recommendations to reduce DNW rates and improve patient engagement:

1. **Targeted Early Interventions at Triage**
    - Identify high-risk patients using predictive characteristics.
    - Activate early engagement through Aboriginal Liaison Officer (ALO) referrals, nurse-only pathways, or rapid assessment models.
2. **Improve Communication While Waiting**
    - Real-time wait updates via screens or mobile tools.
    - Clear signage explaining triage, wait times, and ED processes.
    - Leverage upcoming safe staffing allocations to assign dedicated roles focused on actively managing and engaging with patients identified in this research as being at high risk of DNW—particularly during high-risk times (e.g., evenings).
3. **Optimise Flow and Resourcing**
    - Use data to forecast peak DNW risk, such as the evening period.
    - Adjust staffing and resource allocation based on demand patterns and triage mix.

Key Findings

The local DNW rate (6.0%) exceeded the NSW average (3.9%). Multiple factors were statistically associated with DNW:

- Age: Young adults aged 16–25 had a 42% higher DNW risk compared to children under 5 (HR = 1.42, 95% CI: 1.06–1.90, $p = 0.02$). Patients aged 65 and older had a 48% lower risk (HR = 0.52, 95% CI: 0.38–0.74, $p < 0.001$).
- Gender: Males were 19% more likely to DNW than females (HR = 1.19, 95% CI: 1.03–1.35, $p = 0.02$).
- Indigenous Status: Indigenous patients had a 44% higher DNW risk (HR = 1.44, 95% CI: 1.21–1.66, $p < 0.001$).
- Arrival Mode: Patients arriving by ambulance had a 37% lower risk of DNW (HR = 0.63, 95% CI: 0.48–0.82, $p = 0.0006$).
- Time of Day: Presentations in the evening (1701–2359) were associated with a 41% higher DNW risk (HR = 1.41, 95% CI: 1.21–1.64, $p < 0.001$), despite the shortest median length of stay (LOS = 80 minutes).
- Frequent Presenters: Individuals with multiple visits had a 39% higher risk of DNW (HR = 1.39, 95% CI: 1.08–1.79, $p = 0.01$).
- Triage Category: Patients triaged to Category 5 had an 8-fold increased risk of DNW compared to Category 3 (HR = 8.21, 95% CI: 6.21–10.86, $p < 0.001$).
-

Kaplan-Meier Analysis

The survival curve showed that DNW typically occurred within the first 60–90 minutes of waiting. Younger, low-acuity patients, particularly those arriving in the evening, were more likely to leave early, highlighting the importance of targeted early interventions for this population.

Conclusion

This study highlights critical gaps in the ED experience for specific cohorts, particularly young adults, Indigenous patients, and those presenting during evening hours. By aligning resources, triage practices, and communication strategies with the identified risk factors, EDs, especially in rural contexts can make significant improvements in patient retention and access to care. These evidence-based recommendations are immediately actionable and provide a foundation for broader reform of patient flow in rural emergency settings.

CONTEXT

This research was initiated in response to growing concerns about high rates of DNW at Casino & District Memorial Hospital emergency department in northern New South Wales. As a nurse manager and patient flow leader, I observed firsthand the operational pressures contributing to delays in care and the increasing number of patients leaving before being seen. DNW not only reflects patient dissatisfaction but also represents missed opportunities for timely treatment and equitable access, particularly in rural settings where alternative health services are limited. Despite its impact on safety and performance metrics, local data on DNW trends and risk factors were lacking. This project was pursued to fill that gap, using a data-driven approach to understand which patients are most at risk of leaving, and to develop tailored strategies that could be actioned at a local level. The aim was to drive real improvements in care delivery and contribute to broader patient flow reforms across the region.

INTRODUCTION

Studying patients who do not wait for treatment is important due to the potential impact on both patient care and healthcare systems. Patient walkouts can result in compromised health outcomes as the patient has not received the medical care they were seeking. These patients may have underlying health conditions that can go undiagnosed, untreated, and may lead to worsening or life-threatening conditions (1, 2). The term ‘Did Not Wait’ (DNW) is used to describe patients who leave the Emergency Department while awaiting clinical care or medical assessment to start. These patients have completed triage but have not been reviewed medically or treated under a recognised model of care. They may or may not have initial nursing assessments and observations commenced (1, 3). In the literature the term DNW is used interchangeably with ‘left without being seen’ (LWBS) and ‘walkouts’.

Rates of patients who do not wait for treatment are measured in hospitals internationally. DNW rates are used as a key performance indicator to measure both quality and performance. The Australian College of Emergency Medicine (ACEM 2013) states that prolonged waiting times for undifferentiated patients presenting for emergency care is a failure of both access and quality. Globally, 3% is considered an acceptable benchmark (1). In 2021/22 in Australia the National average was 4.5% and the NSW average was 3.5% (4).

High rates of DNW patients can also reflect issues within the healthcare system, such as prolonged wait times, inefficient patient flow and inadequate communication. All these factors result in patient

dissatisfaction, erode trust in health care institutions and hinder the optimal utilisation of medical resources (5, 22).

By understanding the underlying reasons for patients not waiting for treatment, health care organisations and policy makers can identify areas for improvement in ED processes, staffing, communication strategies and patient education. This research can lead to targeted interventions aimed at enhancing patient experiences, reducing waiting times and ensuring timely access to care, ultimately resulting in better patient outcomes and a more efficient healthcare system. Studies show that higher rates of DNW can reflect a lack of trust in the healthcare institution and impact patient satisfaction (6).

International studies on patients who do not wait for treatment at emergency departments (EDs) reveal several consistent findings and trends. While specific results can vary based on healthcare systems, cultural differences, and study methodologies, some common themes occur:

- **Reasons for DNW:** International studies consistently highlight similar reasons for patients leaving EDs without treatment. Long waiting times, dissatisfaction with the care environment, and non-urgent conditions are primary factors driving patients to walk out (6, 7).
- **Patient Demographics & characteristics:** Certain patient demographics are more likely to leave EDs before receiving treatment. Younger adults particularly those in their 20's and 30's tend to be more prone to walk out (6-8). Patients from lower socioeconomic backgrounds and those with limited access to health care (i.e. uninsured) as well as minorities also exhibit a higher likelihood of leaving without being seen (7). A large European study demonstrated that age, arrival mode and diagnosis was a significant predictor of waiting times (5), whereas a large US study showed that the strongest independent factor for DNW was the time of arrival and the odds of not waiting for treatment were 7 x higher in the evening and night (9).
- **Healthcare system factors & resource utilisation:** Studies emphasise the role of healthcare system factors in patient walkouts. Insufficient staffing, overcrowded ED's, inadequate communication between medical staff and patients and inefficient triage systems all contribute to prolonged wait times, leaving patients feeling frustrated and compelled to leave (10,11). Multiple international studies have shown a strong correlation between time of arrival and volume of patients in the ED directly contributing to high rates of DNW (10, 11). Analysing operational metrics such as volume that directly effects rates of DNW, enables resources to be utilised more effectively leading to increased efficiency (10, 11). A 2021 study conducted in a paediatric ED identified ED crowding as the strongest predictor of DNW, emphasizing that overcrowding significantly impacts the ability to provide timely care in the ED (11). There are also negative financial implications for most organisations for incomplete episodes of care, particularly in the United States where healthcare is mostly performance funded (7).

- **Impact on Health outcomes:** Some international studies demonstrate that patients who leave ED's without being seen may face negative health consequences, their condition may deteriorate resulting in re-presentation and hospitalisation (10). One US study (8) conducted a retrospective analysis to understand the follow up behaviour of patients who DNW, and results showed that a considerable amount of these people sought help elsewhere within a short timeframe. The high prevalence of returns after DNW could highlight a missed opportunity to provide services at the initial encounter (12). The same study also found there was a low incidence of admission post DNW and this may indicate that perhaps patients are 'self-triaging' rather than a failure to provide a service (8). A Portuguese study where DNW rates were extremely low at just 0.5%, found that using DNW as a clinical indicator may lack clinical significance as there was a distinct lack of unfavourable outcomes for patients who DNW, which also perhaps indicates a degree of 'self-triage' (13).
- **Solutions & Interventions:** International research also explores potential solutions to mitigate patient walkouts. These include implementing effective communication strategies to manage patient expectations about wait times, optimising triage systems to prioritise patients based on medical urgency, improving staff training for patient interactions, and addressing the root causes of prolonged waiting times (7, 11, 13). A large European study used an ordinal logistical regression model to fairly accurately predict waiting and treatment times, this could be used to improve ED efficiency in a number of different ways as well as improve patient satisfaction by informing patients of their approximate wait time at triage (5). One international emergency department implemented a rapid assessment zone model with an interdisciplinary team approach which showed a significant reduction in DNW rates from 8% to <2% (14).

International studies all highlight the importance of addressing the underlying factors that contribute to walkouts, such as implementing strategies to reduce wait times, enhance communication and optimise resource utilisation, however as each health care system is unique in its operations, more individualised solutions are needed (7, 11, 13).

Australian studies reveal insights that align with global trends while also highlighting some specific factors within the Australian healthcare context.

- **Reasons for DNW:** Like international studies, Australian research points to long waiting times or perceived long waiting times, negative interactions with staff and the waiting room environment as common reasons for DNW (6).

  Two separate studies showed approximately 20% of patients who DNW left as they either felt better or were reassured by the triage nurse (2, 15).

- **Patient demographics & characteristics:** Consistent with international findings, young to middle-aged male adults with lower triage category were more likely to leave (2, 16). Socioeconomic factors also appear to be a driver in some studies with increased rates of DNW. Laceration/ contusion & abdominal pain were the most common presentations (1, 2). A multisite regional comparative study showed that Indigenous Australians were 1.5 times more likely to leave prior to being seen compared to Non-indigenous Australians (17).
- **Healthcare system factors and resource utilisation:** Overcrowding and total patient volume in the ED at time of walkout was significant in multiple studies. One study in a paediatric ED showed that 74% of patients who DNW would have happily seen a GP for their problem had there been one available (18). In another study 87% of patients waited longer than their recommended triage time (15). A large Australian study in Perth found that DNW rates were lower in tertiary facilities compared with the regional facilities in the same area, this may be explained by tertiary facilities tending toward having more resources (16).
  In multiple studies the time of day and day of week was a strong predictor of DNW, Sunday, Mondays, Tuesdays, and evenings had the highest likelihood of DNW (2, 16, 17, 19). Other studies showed that the volume of patients registered in the ED was strongly correlated to the number of DNW (1, 2).
- **Impact on health outcomes:** Australian research indicated mixed opinions on whether there are potential negative consequences for patients who DNW. There are a few studies that have specifically looked at these outcomes. A 2021 Australian observational study which analysed patients who represented after DNW did not reveal adverse outcomes, increased LOS or increased mortality and there were no adverse outcomes associated with re-presentations (1). Another study which followed up those who represented found that on re-presentation a higher triage category was given which may have indicated a deterioration in condition (15).
  Regardless, high rates of DNW still indicates a failure to provide a service. A 2025 NSWA data linkage study provided state-wide evidence of increased mortality in those who represented after a DNW episode (22).

- **Solution and interventions:** Australian research often highlights the importance of patient-centred care, empowering patients with information, involving them in their care decisions, and creating a more supportive care environment as this can contribute to higher patient satisfaction and reduced walkout rates (2). There are many suggested solutions for the problem of DNW such as targeting specific groups that have been identified by in the research (17, 19). One recommendation is to allocate higher triage categories for indigenous people, as this may reduce walkouts and assist in closing the gap (20). Other research suggests changing models of care to incorporate targeted care delivery in the waiting room may be useful (15).

There is a moderate amount of research examining the characteristics and health system factors related to patients who do not wait for treatment in metropolitan and regional areas in Australia (1, 2, 6, 15, 22). However, there is limited research on DNW's in rural Australian emergency departments. Rural areas can pose unique healthcare challenges due to limited access to healthcare due to provider shortages, lack of services and geographical and cultural barriers (17). These challenges can vary across rural facilities due to differences in service levels in the hospital, the model of care used in the ED (nurse-led, doctor-led, virtual, telehealth), proximity to the referral hospital and availability of community based services like general practice, general dental, and Aboriginal medical services (17).

An Australian comparative study which explored the characteristics of Aboriginal people who either discharged against medical advice or DNW in four regional and rural Emergency Departments in NSW found that the issue is complex and multifactorial and includes cultural issues, racism (real and perceived), accessibility to care, appropriateness of the care provided and lack of alternatives, particularly after hours (17).

As rural areas in Australia are already disadvantaged in terms of health outcomes and access to health care it is important to investigate any avenues that may reduce this disadvantage and improve health outcomes. This research proposal aims to identify factors that contribute to increased rates of walkouts at a rural Emergency Department so that interventions can be put in place to improve access to care in the local community of Casino where rates of patients who DNW are higher than the NSW average.

AIM

To examine the characteristics of patients who did not wait (DNW) for treatment at a rural Australian Emergency Department (ED), and to identify the demographic, clinical, and temporal factors associated with increased risk of DNW using time-to-event analysis. This study aims to address the lack of rural-specific data in existing DNW literature and inform targeted interventions.

METHOD

This was a retrospective cohort study which abstracted patient demographics and service information from the medical record. The study was conducted at Casino & District Memorial Hospital, a rural emergency level 3 hospital located in Northern NSW Local Health District. Casino Emergency department is a 9 bedded unit facility which is staffed by a FACEM (Fellow of the Australian College of Medicine) in the mornings and the evenings from 0800hours until 2300hours, 7 days per week. There is

locum medical officer cover for night duty. There are 2 registered nurses rostered for each of the 3 nursing shifts per day 0700- 1530, 1330 – 2200 & 2130 – 0730. The population of Casino is approximately 11,000 people, not including the surrounding rural areas which may utilise Casino as their primary hospital. The closest referral hospital is Lismore Base Hospital located 30 minutes away by car.

All patients who presented for treatment at Casino & District Memorial Hospital Emergency Department during the study period of 1 January 2023 – 31 December 2023 were included in the study. Each presentation was counted separately. There were 13913 presentations included. Eleven presentations were excluded from the study due to being registered in error.

The following variables were abstracted from the electronic medical record using FirstNet reports and collated in an excel spreadsheet.

Departure status	**Age**	**Gender**	**Indigenous status**	**Marital status**
Arrival mode	**Triage category**	**Presenting problem**	**Presentation day**	**Presentation time**
Re-presentation <7 days	**Frequent presenter >10 in 1 year**	**Residential postcode**	**Compensable status**	**Length of stay (LOS)**

The variables were then sorted into groups - Ages were separated into groups <5, 5-15, 16-25, 26-45, 46-65, >65. Arrival mode was separated into arrived by ambulance vs did not arrive by ambulance. Presenting problems were grouped into system-based categories. Presentation times were categorised as business hours (Day 0800 – 1700, Evening 1701 – 2359 & Night 0000 – 0800). Indigenous refers to self identifies as Aboriginal, Torres Strait Islander, both Aboriginal & Torres Strait Islander or not any of these. ED LOS was recorded in minutes from arrival to recorded departure time. These variables were chosen as they are routinely collected information, easily extracted from the medical record and previous research in this area suggests correlation between these variables and people who did not wait (2, 19).

The data were entered into SAS and a univariate screen was completed on the patient characteristics to compare those who DNW with those who waited and identify any strong predictors for DNW. The chi squared test was used on the nominal variables. The Cochrane-Armitage test was used on ordinal variables. The Wilcoxon signed rank test was used to compare the two medians for LOS. The variables which demonstrated a significant relationship (p-value <0.05) with patients who DNW were then used in a regression model to test the strength of those relationships once all relevant factors were taken into consideration. Cox proportional hazard regression was used to model the outcome rather than a more straightforward logistic regression because it is assumed that the likelihood of DNW will change the longer someone waits to be seen. That is, the outcome is time-dependent (21).

The Cox proportional hazards regression was used in this study because it is a commonly employed method for investigating the relationship between the time to an event (such as survival time) and a set of explanatory variables. In this case, it was applied to analyse the time from arrival to the occurrence of DNW in relation to various factors. This method helps determine the influence of different variables on the time to DNW, allowing for an assessment of how multiple independent variables affect the timing of this outcome.

RESULTS

Patient Characteristics

Patient characteristics are shown in Table 1. The study included 13,913 patients, of whom 13,083 waited for care and 830 did not wait (DNW). The majority of patients were aged between 26 and 45 years (23.14%), with those over 65 representing 24.07%. Younger patients, particularly those aged 16–25 (22.53%) and 26–45 (28.92%), were more likely to DNW compared to older patients (over 65) (13.49%) ($\chi^2(5) = 98.97$, $p<0.0001$). The gender distribution was nearly equal (49.11% male, 50.88% female); however, a higher proportion of males (52.77%) did not wait compared to females (47.22%) ($\chi^2(1) = 4.70$, $p = 0.03$).

Indigenous patients comprised 17.38% of the total cohort but were overrepresented in the DNW group (24.46%) ($\chi^2(1) = 30.72$, $p<0.0001$). Most patients arrived by means other than ambulance (89.66%), with ambulance arrivals significantly less common among DNW patients (6.51%) ($\chi^2(1) = 13.96$, $p = 0.0002$). Unmarried patients were more likely to DNW (75.66%) compared to married patients (24.33%) ($\chi^2(1) = 34.05$, $p<0.0001$).

Triage category was a strong predictor of DNW. Lower-urgency patients (Category 4: 70.63%, Category 5: 16.26%) were more likely to DNW, whereas higher acuity patients (Categories 1–3) were more likely to stay ($\chi^2(1) = 251.19$, $p<0.0001$). The most common presenting problems were injury (16.11%), general symptoms (12.39%), and gastrointestinal issues (10.40%). Patients presenting with general symptoms or ENT/eye complaints were more likely to DNW, while those with cardiovascular problems were less likely ($\chi^2(16) = 74.98$, $p<0.0001$).

Time of presentation influenced DNW rates. While most patients presented between 0800 and 1700 (56.93%), DNW patients were more likely to present during evening hours ($\chi^2(2) = 8.27$, $p = 0.004$). Weekend presentations accounted for 28.16% of total attendance, with no significant difference in DNW rates compared to weekdays ($\chi2(1) = 2.20$, $p = 0.14$). However, a variation was observed across

individual weekdays ($\chi2(6) = 18.41$, $p = 0.006$), with the highest DNW rates on Wednesdays (17.71%) and Thursdays (15.78%) and the lowest Fridays (12.29%) and Saturdays (11.20%).

Frequent presenters (more than 10 visits per year) comprised 5.52% of the total cohort and were significantly more likely to DNW (8.07% vs 5.36%) $\chi^2(1)=0.94$, $p=0.001$). Re-presentations within 7 days occurred in 14.29% of cases, with no significant difference between those who waited and those who DNW ($\chi^2(1) =0.00$, $p = 0.97$).

The median ED length of stay (LOS) for all patients was 102 minutes (IQR: 55–180 minutes). Patients who did not wait had a significantly shorter median LOS of 89 minutes (IQR: 44–155), compared to 102 minutes (IQR: 56–182) for those who waited ($p<0.0001$).

In summary, patients who did not wait for care were more likely to be younger, male, Indigenous, unmarried, lower-acuity, and frequent users of the ED. DNW presentations were more common during evening hours and varied significantly by day of the week, with higher rates on Wednesdays and Thursdays. These patients were less likely to arrive by ambulance, had shorter ED lengths of stay, and were more likely to present with non-urgent complaints such as general symptoms or ENT/eye issues. No significant differences were observed in DNW rates based on weekend presentation or 7-day re-presentation.

To better understand the relative impact of these factors over time, a Cox proportional hazards regression was performed.

Table 1:

Baseline demographic and clinical characteristics comparing groups of patients who waited for care and those who did not wait for care in a rural hospital emergency department.

Variable	Total (n=13913)	Waited (n=13083)	DNW (n=830)	p-value
Age (years)				<0.0001 [a]
<5	1101 (7.91%)	1040 (7.94%)	61(7.35%)	
5-15	1455 (10.45%)	1359 (10.39%)	96 (11.57%)	
16 - 25	2033 (14.61%)	1846 (14.11%)	187 (22.53%)	
26 - 45	3220 (23.14%)	2980 (22.78%)	240 (28.92%)	
46 - 65	2754 (19.79%)	2620 (20.03%)	134 (16.14%)	
>65	3350 (24.07%)	3238 (24.75%)	112 (13.49%)	
Male	6834 (49.11%)	6396 (48.89%)	438 (52.77%)	0.03 [a]
Female	7079 (50.88%)	6687 (51.11%)	392 (47.22%)	
Indigenous	2419 (17.38%)	2216 (16.94%)	203 (24.46%)	<0.0001 [a]
Not Indigenous	11494 (82.61%)	10867 (83.06%)	627 (75.54%)	
Arrival status				
Ambulance	1438 (10.33%)	1384 (10.58%)	54 (6.51%)	0.0002 [a]
Not ambulance	12475 (89.66%)	11699 (89.19%)	776 (93.49%)	
Married	4677 (33.61%)	4475 (34.20%)	202 (24.33%)	<0.0001 [a]
Not married	9236 (66.38%)	8608 (65.79%)	628 (75.66%)	
Triage cat				<0.0001 [b]
1	30 (0.21%)	30 (0.23%)	0 (0%)	
2	1404 (10.09%)	1393 (10.64%)	11 (1.33%)	
3	3825 (27.49%)	3728 (28.49%)	97 (11.77%)	
4	7421 (53.33%)	6839 (52.27%)	582 (70.63%)	
5	1227 (8.81%)	1093 (8.35%)	134 (16.26%)	
Pres prob (diagnosis)				<0.0001 [a]
Gastrointestinal	1448 (10.40%)	1373 (10.49%)	75 (9.10%)	
Cardiovascular	919 (6.60%)	899 (6.87%)	20 (2.43%)	
General symptoms	1724 (12.39%)	1593 (12.18%)	131 (15.90%)	
Infection	677 (4.86%)	628 (4.80%)	49 (5.95%)	
Injury	2242 (16.11%)	2120 (16.20%)	122 (14.81%)	
Respiratory	995 (7.15%)	949 (7.25%)	46 (5.58%)	
Musculoskeletal	1168 (8.39%)	1100 (8.40%)	68 (8.25%)	

Neurology	488 (3.50%)	469 (3.58%)	19 (2.31%)	
Mental Health	142 (1.02%)	126 (0.96%)	16 (1.94%)	
Drug Health	27 (0.19%)	21 (0.16%)	6 (0.73%)	
ENT/ Eyes	1435 (10.31%)	1329 (10.16%)	106 (12.86%)	
Admin (cert)	1376 (9.89%)	1279 (9.78%)	97 (11.77%)	
Urinary	442 (3.17%)	422 (3.22%)	20 (2.43%)	
Endocrine	19 (0.13%)	19 (0.15%)	0 (0%)	
Ob & gynae	138 (0.99%)	128 (0.98%)	10 (1.21%)	
Skin conditions	666 (4.78%)	627 (4.79%)	39 (4.73%)	
Representation 7 days	1989 (14.28%)	1870 (14.29%)	119 (14.34%)	0.97 [a]
Freq presenter (more than 10/ year)	769 (5.52%)	702 (5.36%)	67 (8.07%)	0.001 [a]
Presentation time				0.004 [a]
0000 - 0759	2314 (16.63%)	2194 (16.775)	116 (13.98%)	
0800 - 1700	7922 (56.93%)	7456 (56.99%)	464 (55.90%)	
1701 – 2359	3688 (26.50%)	3433 (26.24%)	250 (30.12%)	
Weekend	3919 (28.16%)	2702 (28.30%)	215 (25.90%)	0.14 [a]
Weekdays				0.006
Monday	2131 (15.31%)	2002 (15.30%)	129 (15.54%)	
Tuesday	2063 (14.82%)	1957 (14.95%)	106 (12.77%)	
Wednesday	1936 (13.91%)	1789 (13.67%)	147 (17.71%)	
Thursday	1951 (14.02%)	1820 (13.90%)	131 (15.78%)	
Friday	1915 (13.76%)	1813 (13.85%)	102 (12.29%)	
Saturday	1875 (13.47%)	1782 (13.62%)	93 (11.20%)	
Sunday	2042 (14.67%)	1920 (14.68%)	122 (14.70%)	
ED length of stay in minutes (IQR)	102 (55-180)	102 (56-182)	89 (44-155)	<0.0001 [c]

Cox (Proportional Hazards) Regression Analysis

Key Findings from the Cox Proportional Hazards Model:

Cox Proportional Hazards Model is shown in table 2. Weekend attendance and re-presentation within seven days were excluded from the model as they were not clinically or statistically significant, all other variables which were included showed significant univariate associations.

There was a significant association between DNW status and age. Patients in the 16-25 years age group have a 42% higher risk of DNW compared to those under 5 years old (HR=1.42,95%CI= 1.06-1.92, p=0.02). There was also an association for those over 65 Years, with elderly patients exhibiting a 48%

lower risk of DNW (HR=0.52, 95%CI= 0.38-0.74, p=0.0001), therefore indicating they are significantly less likely to leave prematurely than the reference category of those aged under 5 years old.

Male patients demonstrated a 19% higher risk of DNW compared to their female counterparts (HR=1.19, 95%CI= 1.03-1.35, p = 0.01). This finding suggests that males are more likely to leave the emergency department without waiting for treatment. Unmarried individuals have a 23% higher risk of DNW compared to married patients (HR=1.23, 95%CI= 1.05-1.46, p=0.02). This suggests that marital status may influence a patient's likelihood of leaving the emergency department without receiving treatment.

Patients presenting with abdominal pain demonstrated a 28% lower risk of DNW compared to those with general symptoms (HR=0.72, 95%CI= 0.55–0.95, p=0.02). Similarly, patients with injuries had a 33% lower risk (HR=0.67, 95%CI= 0.52–0.86, p=0.0013), and those with musculoskeletal complaints had a 34% lower risk of DNW (HR=0.66, 95%CI= 0.49–0.88, p=0.005). Patients with renal or urological problems were also significantly less likely to leave, showing a 40% lower risk of DNW (HR=0.60, 95%CI= 0.37–0.95, p=0.03). These findings suggest that patients with more defined or painful physical symptoms may be more inclined to wait for medical assessment. Presentations related to cardiovascular issues, ENT/eye complaints, and mental health or drug-related concerns did not show a statistically significant difference in DNW risk compared to the reference category.

Patients categorized as Triage 2 have a 46% lower risk of DNW compared to those in Triage 3 (HR=0.44, 95% CI: 0.28–0.68, p = 0.0003). This statistically significant finding suggests that high-acuity patients are prioritized for treatment, reducing their likelihood of leaving before being seen. In contrast, Triage 4 patients face a significantly higher risk of DNW, with a threefold increase compared to Triage 3 patients (HR=3.91, 95% CI: 3.18–4.80, p < 0.0001). This result highlights that patients with moderate acuity are more likely to leave. The highest risk is observed among Triage 5 patients, who exhibit an eightfold increase in DNW compared to Triage 3 patients (HR=8.21, 95% CI: 6.21–10.86, p < 0.0001). This substantial rise suggests that low-acuity patients are the most likely to leave without being seen.

Patients presenting to the emergency department during evening hours (1701–2359) have a 41% higher risk of DNW compared to those arriving during the daytime (HR = 1.41, 95% CI = 1.21–1.64, p < 0.0001). This period also corresponds with the shortest median length of stay (LOS) at 80 minutes, suggesting that patients are more likely to leave quickly during the evening hours.

In contrast, there was no significant difference in the risk of DNW for patients arriving during night time hours (0000–0759) compared to daytime (HR = 0.95, 95% CI = 0.78–1.16, p = 0.62). The median LOS during this period is 95 minutes, aligning closely with daytime figures, indicating that patient departure patterns remain stable overnight.

Indigenous patients have a 42% higher risk of DNW compared to non-Indigenous patients (HR=1.42, 95% CI= 1.21–1.66, p <0.0001).

Patients arriving by ambulance have a 37% lower risk of DNW compared to those who arrive by other means (HR=0.63, 95% CI= 0.48–0.82, p=0.006). Frequent emergency department presenters have a 39% higher risk of DNW compared to less frequent visitors (HR = 1.39, 95% CI = 1.08–1.79, p = 0.01).

Table 2:

Cox proportional hazard modelling using variables that were predictors for patent who did not wait for care at a rural hospital emergency department.

Variable	Hazards Ratio	95%CI	P value
Age			
<5	[ref]		
5-15	1.07	0.79, 1.51	0.67
16 - 25	1.42	1.06, 1.92	0.02
26 - 45	1.22	0.91, 1.63	0.20
46 - 65	0.90	0.66, 1.23	0.51
>65	0.52	0.38, 0.74	0.0001
Male	1.19	1.03,1.35	0.01
Not married	1.23	1.05, 1.46	0.02
Presenting problem			
General symptoms	ref	na	na
Abdo Pain	0.72	0.54, 0.95	0.02
Cardiovascular	1.19	0.75, 1.89	0.4557
Infection	0.81	0.58, 1.12	0.2026
Injury	0.66	0.52, 0.86	0.0013
Respiratory	0.74	0.53, 1.03	0.078
Musculoskeletal	0.66	0.49, 0.88	0.005
Neurological	0.90	0.59, 1.36	0.6203
Mental/ Drug Health	1.30	0.8, 2.14	0.2833
ENT/eye	0.97	0.75, 1.26	0.8345
Administrative	0.88	0.67, 1.15	0.3648
Renal / Urological	0.60	0.37, 0.95	0.0309
Other	0.80	0.58, 1.09	0.1638
Triage category			
1	0.71	0.10, 5.12	0.73
2	0.44	0.28, 0.68	0.0003
3	ref	na	na
4	3.91	3.18, 4.80	<0.0001
5	8.21	6.21, 10.86	<0.0001

Business hours			
0800 – 1700	Ref		
1701 – 2359	1.41	1.21, 1.64	<0.0001
0000 – 0759	0.95	0.78, 1.16	0.62
Indigenous	1.42	1.21, 1.66	<0.0001
Ambulance	0.63	0.48, 0.82	0.0006
Frequent presenter	1.39	1.08, 1.79	0.01

Length of stay and time of day

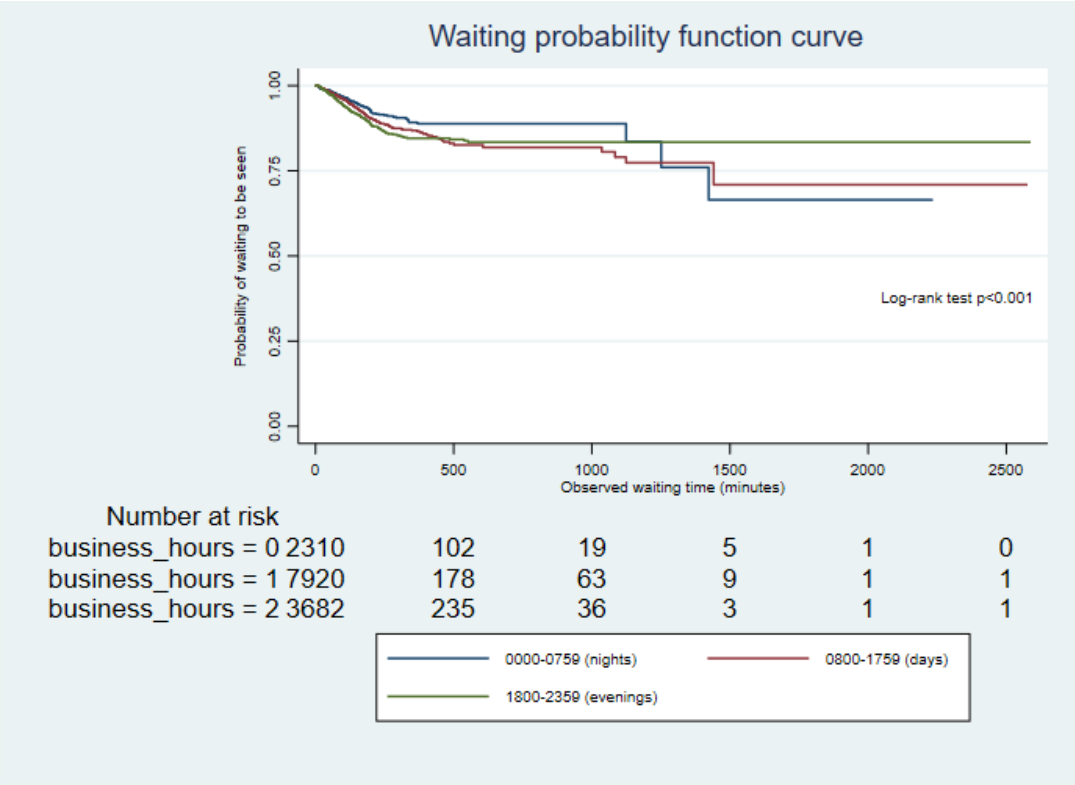
Analysis of Length of Stay (LOS) by business hours reveals that the shortest median LOS occurs during the evening (80 minutes, IQR 42-133), coinciding with a significantly higher risk of patients leaving without being seen (a 41% increase in DNW). In contrast, daytime (93 minutes, IQR 45-157) and night time (95 minutes, IQR 45-170) have longer median LOS yet do not show a significantly elevated DNW risk. This pattern suggests that evening presentations are more strongly associated with early departures, whereas patients presenting during the day or night are waiting longer.

Kaplan-Meier curve

The Kaplan-Meier curve illustrates the probability of patients remaining in the Emergency Department over time before leaving without being seen. In this study, the curve shows that patients presenting during the evening hours left more quickly, with a steeper drop-off in the survival curve. This suggests a lower tolerance for waiting during evening periods, likely due to higher patient volumes and reduced staffing. In contrast, patients presenting during the day or night had a more gradual decline, indicating they were more likely to wait longer before leaving.

Figure 1:

Kaplan-meier curve demonstrating the probability of patients remaining in the emergency department over time before leaving without receiving care



The green line (evenings) has a more rapid rate of patient drop-offs, meaning patients who DNW are not waiting long before leaving, whereas the blue line has a more gradual drop-off, indicating patients are waiting longer before deciding to leave.

Test used a = chi square, b = Cochrane Armitage test, c = Wilcoxon rank sum test, d = log rank test

DISCUSSION

This study aimed to identify the factors associated with patients who DNW for treatment in a rural Australian ED The findings demonstrate that the study successfully met this aim, revealing key demographic, clinical, temporal, and operational predictors of DNW behaviour within the local context.

These results align with national and international literature, offering local insights and highlighting opportunities for targeted interventions to reduce DNW rates and improve access to timely care. As outlined in the introduction, DNW is not only a performance indicator but also reflects systemic inefficiencies, patient dissatisfaction, and inequities in healthcare access (3, 4). With a local DNW rate exceeding the New South Wales average, this research provides a critical lens into the specific drivers of patient walkouts in a rural setting.

Demographic Predictors

A significant finding was the association between age and DNW rates. Our finding that patients aged 16–25 were 42% more likely to leave without being seen compared to those under five aligns with previous research indicating young adults are more likely to DNW, potentially due to perceived lower urgency, competing life priorities, and lower tolerance for delays (19, 18, 22). Conversely, patients aged over 65 were significantly less likely to DNW, echoing findings that older individuals may perceive a greater need for medical care and be more likely to wait for treatment (16). Similarly, sociodemographic factors such as being male and unmarried also influenced DNW, consistent with literature suggesting that lower health-seeking behaviour and reduced social support may contribute to early departure (7, 12, 22). Understanding which demographic groups are more likely to DNW enables EDs to tailor communication, engagement strategies, and waiting room support to at risk groups such as young adults and indigenous patients.

Triage Acuity and Presenting Problems

Triage category demonstrated a strong association with DNW. As expected, lower acuity patients (Triage 4 and 5) were significantly more likely to leave without being seen, with Triage 5 patients facing an eightfold increased risk. These findings align with prior studies indicating that long perceived wait times and low prioritisation contribute to walkouts among low-acuity patients (11, 15, 22). Conversely, Triage 2 patients were 47% less likely to DNW, likely reflecting higher prioritisation and urgency. Presenting problem also influenced DNW behaviour. Patients with physical or painful complaints, such as abdominal pain, injuries, and musculoskeletal issues were less likely to leave, suggesting these individuals perceived greater urgency. In contrast, those presenting with general symptoms (the reference category) had the highest DNW rates, possibly due to vague or non-specific complaints. Although raw DNW rates were higher in some groups (e.g. mental health and cardiovascular presentations), these did not reach significance in adjusted models, possibly due to small sample sizes or overlapping risk factors. These results support the implementation of fast-track or streaming models for low-acuity patients and underscore the need for early clinical engagement, particularly for those presenting with less-defined or ambiguous complaints who may otherwise go unprioritized.

Temporal Patterns and Cultural Factors

Time of presentation significantly influenced DNW behaviour. Evening arrivals (1701–2359) were associated with a 41% increased risk of DNW compared to daytime arrivals, likely due to increased

patient volume, reduced staffing, and associated delays (10, 11, 22). This reinforces the need to align staffing patterns with periods of peak demand to prevent crowding and perceived neglect. Indigenous status also emerged as a significant predictor, with Indigenous patients 42% more likely to DNW. This finding reflects broader systemic and cultural barriers, including racism, a lack of culturally safe care, and diminished trust in healthcare institutions (17, 20). In the rural context, where cultural safety may be less embedded, these results emphasise the urgency of embedding culturally safe practices and improving communication with Indigenous patients to reduce walkouts and promote equity in emergency care access.

Operational and System-Level Factors

Operational variables further shaped DNW risk. Patients arriving by ambulance were 37% less likely to DNW, consistent with international studies suggesting these individuals are triaged and seen more quickly due to presumed acuity (7, 6). In contrast, frequent presenters had a 39% increased risk of DNW, potentially reflecting unresolved chronic health issues, dissatisfaction with previous encounters, or unmet psychosocial needs (6, 15, 22). The combined impact of these findings highlights the multifaceted nature of DNW and its strong connections to both individual patient characteristics and systemic healthcare constraints.

Implications for Rural Health Services

Collectively, these findings reinforce national and international concerns that DNW is a symptom of deeper system level problems; prolonged wait times, misaligned resource allocation, cultural insensitivity, and inefficient patient flow (7, 11, 17, 22). While these challenges are familiar across ED settings, their effects are magnified in rural areas where service availability, staffing, and after-hours options are often limited. The rural context also brings higher rates of socioeconomic disadvantage and cultural diversity, compounding access barriers. Therefore, addressing DNW in rural EDs like Casino requires more than general ED reforms; it calls for locally tailored solutions, such as dedicated fast-track pathways for low-acuity presentations, culturally safe models of care, and improved communication during peak periods. These findings support that DNW is not simply a KPI to be monitored but a meaningful signal of unmet patient needs and structural gaps, particularly in rural and resource-limited settings.

Contribution to the Literature

While existing literature has identified general trends and risk factors associated with patients who did not wait, such as age, gender, triage category, and time of presentation, most studies have been

conducted in metropolitan settings or have focused on aggregated national data. These studies often lack granularity regarding rural-specific contexts.

This study addressed that gap by examining DNW presentations within a single rural Australian ED, providing localised insights into patient demographics, temporal patterns, and presenting problems. We also employed a Cox proportional hazards model to evaluate the time to DNW. This provides a more detailed understanding of how risk factors influence not only the likelihood of DNW, but also the timing of a patient's decision to leave. By capturing data at the local level and applying time-to-event analysis, this research adds a rural-specific, temporally nuanced dimension to the DNW literature, information that is essential for developing targeted interventions in resource-limited settings.

Strengths & Limitations

This study provides a comprehensive, population-level analysis using all presentations in a rural Australian ED over a full calendar year (n = 13,913), ensuring robust statistical power and seasonally balanced data. The inclusion of all presentations, rather than a sample, offers a complete view of patient flow dynamics, enabling accurate identification of high-risk groups and operational patterns.

Secondly, the study used time-to-event analysis (Cox proportional hazards regression), which is well-suited for modelling DNW behaviour as a function of wait time. This method allowed for more nuanced understanding of when patients were likely to leave, accounting for the time-dependent nature of the outcome and improving on more simplistic logistic models.

The rural focus of the study, where DNW research is limited but urgently needed is another strength. By identifying demographic and temporal risk factors specific to a rural setting, the study fills an important gap in the literature and provides data-driven recommendations that are locally relevant and operationally feasible.

This study also linked findings directly to practical interventions, making the results highly actionable for local health managers and clinicians seeking to improve access and equity in emergency care.

There are several factors that should be taken into account when interpreting the findings. As a single-site study conducted at a rural emergency department, the generalisability of results is limited. The patient population, staffing models, and local health service context may differ significantly from those in other rural, regional, or metropolitan hospitals. As such, the identified risk factors for DNW presentations may not be directly transferable to other settings.

All emergency department presentations within the study period were included in the analysis, including

repeat presentations by the same patient. While this approach captured the full scope of ED utilisation, it may have introduced bias related to frequent presenters, who are known to have distinct care needs and behaviours. Eleven presentations were excluded due to registration errors. Repeat presentations were retained to reflect real-world patterns of access, but this may have slightly skewed hazard estimates for specific subgroups.

The study relied on retrospective administrative and clinical data, meaning data quality was inherently dependent on the accuracy of triage documentation and coding practices. Despite efforts to clean and validate the dataset, inconsistencies in data entry may be present. Some presenting problems could not be modelled independently due to small sample sizes, leading to the combination of similar categories to maintain model stability. Attempts to retain more granular symptom groupings resulted in model convergence issues in the Cox proportional hazards regression.

Variability in medical staffing coverage across shifts and throughout the year may have also influenced DNW patterns but was not directly measured in this study. Lastly, the analysis was limited to observable demographic and clinical factors. It did not include patients' reasons for leaving, personal perceptions of wait times, or other qualitative influences on DNW behaviour.

Conclusion & Recommendations

The DNW rate at Casino ED, which exceeds the state average, signals the need for localised, practical responses to reduce walkouts and improve timely access to care. This study has demonstrated that several patient and system-level factors are significantly associated with the likelihood of DNW behaviour in a rural Australian emergency department. Specifically, younger age, male gender, Indigenous status, low triage acuity, evening presentation times, and frequent ED attendance were all linked to increased risk of leaving without being seen.

Using time-to-event analysis via Cox proportional hazards regression, the study provided a nuanced understanding of not only which patients are most at risk of DNW, but also when they are most likely to leave. The majority of DNW events occurred within the first 60–90 minutes of arrival, emphasising the critical importance of early engagement at triage.

While the findings align with broader national and international research, this study highlights the unique challenges facing rural emergency departments—such as limited-service availability, variable staffing, and the need for culturally safe care.

This research has demonstrated the value of rural-specific, real-time data in understanding patient behaviour and service demand. It contributes a much-needed evidence base to support equity-focused, locally responsive strategies that enhance access to emergency care in rural Australia.

Based on these findings, the following recommendations are proposed to inform policy and practice:

1. Targeted Early Interventions at Triage

- Identify high-risk patients using predictive characteristics.
- Activate early engagement through Aboriginal Liaison Officer (ALO) referrals, nurse-only pathways, and rapid assessment models.

2. Improve Communication While Waiting

- Provide real-time wait updates via screens or mobile tools.
- Install clear signage explaining triage, wait times, and ED processes.
- Leverage upcoming safe staffing allocations to assign dedicated roles focused on managing and engaging patients at higher risk of DNW, particularly during peak periods such as evenings.

3. Optimise Flow and Resourcing

- Use local data to forecast peak DNW risk, particularly by time of day.
- Adjust staffing levels and resource allocation in alignment with predictable demand and triage mix.

By implementing these targeted strategies, rural emergency departments can reduce avoidable DNW events and deliver more timely, equitable, and person-centred emergency care.

REFERENCES

1. Bin Mohamed Ebrahim ME, Tang M, Vukasovic M, Coggins A. Contemporary evaluation of adverse outcome risks associated with 'did not wait' emergency department presentations. Emergency medicine Australasia : EMA. 2021;33(5):932-4.

2. Blake DF, Dissanayake DB, Hay RM, Brown LH. 'Did not waits': A regional Australian emergency department experience: Did Not Waits. Emergency Medicine Australasia. 2014;26(2):145-52.

3. NSW Government. Emergency Department Patients Awaiting Care. In: NSW Health, editor.: System Purchasing; 2018.

4. Australian Institute of Health and Welfare. Emergency Department Care 2023 [Available from: https://www.aihw.gov.au/reports-data/myhospitals/sectors/emergency-department-care.

5. Ataman MG, Sariyer G. Predicting waiting and treatment times in emergency departments using ordinal logistic regression models. The American journal of emergency medicine. 2021;46:45-50.

6. Marco CA, Bryant M, Landrum B, Drerup B, Weeman M. Refusal of emergency medical care: An analysis of patients who left without being seen, eloped, and left against medical advice. The American journal of emergency medicine. 2021;40:115-9.

7. Pham JC, Ho GK, Hill PM, McCarthy ML, Pronovost PJ. National Study of Patient, Visit, and Hospital Characteristics Associated With Leaving an Emergency Department Without Being Seen: Predicting LWBS. Academic Emergency Medicine. 2009;16(10):949-55.

8. Li DR, Brennan JJ, Kreshak AA, Castillo EM, Vilke GM. Patients Who Leave the Emergency Department Without Being Seen and Their Follow-Up Behavior: A Retrospective Descriptive Analysis. The Journal of emergency medicine. 2019;57(1):106-13.

9. Suastegui C, Lozano JM, Maniaci VM, Linares MY-R. Comparison of the Demographics and Visit Characteristics of Patients Who Left the Pediatric Emergency Department Without Being Seen With Those Who Were Evaluated in the Emergency Department. Pediatric emergency care. 2021;37(6):e329-e33.

10. Chiu DT, Stenson BA, Alghamdi M, Antkowiak PS, Sanchez LD. The association between day of arrival, time of arrival, daily volume and the rate of patients that "left without being seen". The American journal of emergency medicine. 2023;67:24-8.

11. Gorski JK, Arnold TS, Usiak H, Showalter CD. Crowding is the strongest predictor of left without being seen risk in a pediatric emergency department. The American journal of emergency medicine. 2021;48:73-8.

12. Roby N, Smith H, Hurdelbrink J, Craig S, Hawthorne C, DuMontier S, et al. Characteristics and retention of emergency department patients who left without being seen (LWBS). Internal and emergency medicine. 2022;17(2):551-8.

13. Sousa R, Correia C, Valsassina R, Moeda S, Painho T, Oom P. Children Who Leave the Emergency Department Without Being Seen: Why Did They Leave and What Would Make Them Stay? Acta medica portuguesa. 2018;31(2):109-14.

14. Faber J, Coomes J, Reinemann M, Carlson JN. Creating a Rapid Assessment Zone with Limited Emergency Department Capacity Decreases Patients Leaving Without Being Seen: A Quality Improvement Initiative. Journal of emergency nursing. 2023;49(1):86-98.

15. Crilly J, Bost N, Gleeson H, Timms J. Patients who presented to an Australian emergency department and did not wait or left against medical advice: a prospective cohort follow-up study. Advanced emergency nursing journal. 2012;34(4):357-68.

16. Hall J, Jelinek GA. Characteristics and outcomes of patients who “did not wait” after attending Perth public hospital emergency departments, 2000–2003. Medical Journal of Australia. 2007;187(11-12):626-9.

17. Wright L. “They just don’t like to wait” A comparative study of Aboriginal and non-Aboriginal people who did not wait for treatment or discharged against medical advice from rural emergency departments: Part 1. Australasian Emergency Nursing Journal. 2009;12(3):78-85.

18. Ng Y, Lewena S. Leaving the paediatric emergency department without being seen: understanding the patient and the risks. Journal of paediatrics and child health. 2012;48(1):10-5.

19. Mohsin M, Forero R, Ieraci S, Bauman AE, Young L, Santiano N, et al. A population follow-up study of patients who left an emergency department without being seen by a medical officer. Emergency Medicine Journal : EMJ. 2007;24(3):175-9.

20. Hutton J, Gunatillake T, Barnes D, Phillips G, Maplesden J, Chan A, et al. Characteristics of First Nations patients who take their own leave from an inner-city emergency department, 2016-2020. Emergency medicine Australasia : EMA. 2023;35(1):74-81.

21. Hosmer DW, Lemeshow S, May S. Applied survival analysis: regression modeling of time-to-event data. 2nd ed. Hoboken (NJ): Wiley-Interscience; 2008.

22. Dinh MM, Seimon RV, O'Sullivan J, Berendsen Russell S, Bein K. Characteristics and outcomes of emergency department patients who did not wait for treatment: A state-wide data linkage analysis from New South Wales, Australia. Emergency Medicine Australasia. 2025;37(4):e70095.