Non-traumatic dental presentations at emergency departments in New Zealand

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ABSTRACT

INTRODUCTION: Many low-income New Zealanders attend emergency departments (EDs) for relief of dental pain and infection. This places a substantial burden on EDs. Better understanding of non-traumatic dental presentations (NTDPs) will aid the development of relevant health policy and clinical management strategies.

AIM: To explore the nature, context and impact of NTDPs on New Zealand EDs.

METHODS: A mixed-methods approach was used. Routinely collected data on NTDPs to ED at four New Zealand hospitals were analysed descriptively, and semi-structured interviews with ED and dental personnel (n=20) from the four hospitals were conducted and analysed thematically.

RESULTS: Young adults (20–39 years), and Māori and Pacific people, were frequent ED attenders for NTDPs; repeat visits were common. Most were seen by non-dental health practitioners. Cost and access were identified as barriers to dental care. Management of NTDPs generally involved analgesics for relief of pain and antibiotics for infection management. All participants said definitive care pathways for NTDPs were lacking. There is potential to improve staff training in diagnosis and anaesthetic administration. However, participants were more interested in referral pathways and public funding for dental care.

CONCLUSIONS: Accessible and equitable dental care pathways and policies are urgently required to enable timely and appropriate care for NTDPs.

Long patient stays and overcrowding at New Zealand emergency departments (EDs), a situation that appears to be worsening with time, may jeopardise timely access to quality care for acute conditions.[1,2] Media reports and anecdotal evidence suggest that toothaches, dental abscesses and other non-traumatic dental presentations (NTDPs) contribute to stress on New Zealand EDs.[3–6] There is a paucity of research on NTDPs at New Zealand EDs. In other countries, NTDP presentations to EDs are common among vulnerable population subgroups,[7–13] and typically the ED workforce has difficulty managing them due to a lack of dentally-skilled staff, appropriate facilities and capacity.[8] Consequently, patients usually receive symptomatic treatment—antibiotics and pain relief—meaning repeat visits are common.[7–9,14] Acute dental conditions have serious consequences for wellbeing; their management is costly, and they place stress on health systems.[7–15]

In New Zealand, almost all adult dental treatment is provided by community-based private dental practitioners and paid for out-of-pocket. Consequently, accessing dental care can be challenging for those on lower incomes,[16–18] and the majority of New Zealanders only attend a dentist when they have a problem (pain or infection).[16,19] Ethnic and socioeconomic disparities in unmet dental need and access to dental care among New Zealand adults are well-established,[16,19] yet only very limited publicly-provided urgent dental care is available for New Zealanders on low incomes.[20] In addition, such services are typically provided only during normal business hours and frequently include a fee-for-service component. Thus it would not be surprising to see NTDPs at New Zealand EDs, given ED care is readily accessible and provided at no cost.

Given most NTDPs are preventable and able to be addressed in a primary care

setting, the majority of NTDPs and their consequences—for patients, ED and the health system—are potentially avoidable. To inform actions to reduce the burden of NTDPs and unmet dental need and oral health disparities among adult New Zealanders, more information is needed about the extent and nature of NTDPs at New Zealand EDs and the factors that affect care. This study aimed to fill this knowledge gap.

Methods

This study used a mixed-methods approach. Ethical approval from the University of Otago Human Ethics Committee (Health) (HD18/082) and locality approvals from participating district health boards (DHBs) were obtained. Four DHBs were purposively selected to provide a range of population and hospital characteristics: two (A and B) served large, urban populations (>300,000) with low proportions of Māori (<10%), and two (C and D) served provincial populations (<200,000) with high proportions of Māori (>20%).

Retrospective routinely collected data on dental presentations to ED for 2018 were requested from each DHB. They were asked to provide anonymised data on dental presentations at ED as outpatient treatment of NTDPs (toothaches and dental abscesses; excluded care related to Accident Compensation Corporation claims) including ethnicity, age at presentation, referral source (if any), the type of practitioner(s) each patient was seen by, diagnosis, treatment provided and details on any referrals for further care. Not all DHBs provided all the requested information; some provided more detail than was requested. The data also differed in presentation: for example, two DHBs provided data on ethnicity using a three-category system (Māori, Pacific, other), whereas the other two DHBs used the New Zealand Level 1 ethnicity classification (six categories). In addition, DHBs provided data for differing ranges of dates. Data were cleaned and analysed descriptively using STATA 15.1 SE. Some data (eg, practitioner type) were categorised to enable comparisons among the DHBs.

Key informant interviews were conducted at the DHBs. Participants were selected purposively from each of the selected DHBs' main hospital emergency and dental departments, with the inclusion of a range of personnel involved in the care of NTDPs being ensured. Email invitations, along with a study information sheet and consent form, were sent to each department's clinical directors, who then invited staff to participate in face-to-face, phone or video interviews.

The sample comprised 20 participants, including ED nurse practitioners, clinical nurse specialists, triage nurses, consultants, clinical directors, dental house surgeons, dental specialist and clinical directors (Table 1). Semi-structured interview schedules gathered information on the contextual aspects of NTDPs and their management at ED, including the participants' perspectives on the nature of NTDPs at ED, how patients were managed, EDs' capacity to manage NTDPs and how staff and ED services could be better supported. Interviews were conducted by CG, CS or ML, who had been trained in qualitative interviewing, and each was accompanied by a senior researcher (MS or AF). Prior to data collection, pilot interviews were conducted with two ED doctors and a dental house surgeon, and the interview schedule was amended to incorporate their feedback. All interviews were recorded (with permission) and transcribed verbatim.

Text data were analysed using thematic analysis. CG, CS and ML undertook the initial analysis and identified main themes, initially within a transcript and then across transcripts. Several transcripts were cross-coded among CG, CS and ML for agreement on coding. In consultation with senior researchers (AF, JB and MS), final themes were confirmed, and discordant themes were discussed until consensus was achieved.

Results

Routinely collected data

Annual NTDP attendances in the DHBs ranged from 51 to 79 per 10,000 for Māori, 66 to 103 for Pasifika and 16 to 33 for non-Māori, non-Pasifika. Attendance among young adults (aged 20–39 years) was higher than other age groups at three DHBs (Figure 1). The majority of cases were attended by ED nursing staff, senior/house surgeons

or registrars; the proportion of cases seen in ED by a dentist or dental specialist was <10% (Supplementary Table 1). Of all visits, 6.0–15.4% were repeat visits. A greater proportion of NTDPs and repeat visits were made in smaller DHBs than in larger DHBs.

Diagnostic codes for NTDPs differed by DHB (Supplementary Table 1); DHB A reported multiple diagnoses per patient, whereas DHBs B, C and D provided only a primary diagnosis. DHB D diagnosed "caries" for the majority (53.4%) of its cases; this diagnostic classification was rarely used at the other DHBs. Only DHB A used a diagnosis of "toothache." "Dental abscess" was common to all DHBs and made up a substantial proportion of cases (DHB B 50.8%, DHB C 33.9%, DHB A 28.3% and DHB D 19.9%). A considerable proportion of cases at DHB D had no diagnosis reported (14.0%). Only DHB A provided data on triage coding for NTDPs, and of these the majority were scored 4 (65.0%) or 5 (12.3%), with just over one-fifth scoring 3 (22.3%) or 2 (0.5%); none scored 1. (New Zealand follows the Australasian Triage Scale, which ranges from 1–5: the lower the score, the greater severity of the presenting condition and urgency of care required.)

DHBs A and D did not provide data on patient treatment. The majority of cases treated at DHBs B and C had "null" or "unknown" treatment (88.1% and 57.5%, respectively). Of the remaining cases, a small proportion involved tooth extraction (1.2% and 1.6%, respectively) or incision and drainage of a dental abscess (5.8% and 2.7%, respectively). DHB C reported use of local anaesthetic (provided in 23.4% of NTDP cases), whereas DHB B did not report this.

Only DHB B provided data on NTDP admissions and discharges. Most patients were "treated" and discharged (70.0%). Almost one-fifth were admitted to a ward or assessment planning unit (18.7%). A small proportion were admitted to short stay (3.0%) or ED observation (5.5%) units, or were recorded as referred, discharged after triage or self-discharged.

Key informant interviews

Findings were categorised into four domains: the nature of presentations, reasons for presenting, management of NTDPs and possible solutions.

Nature of presentations

NTDPs were described by almost all participants as occurring at their respective DHBs "every other day" (participant N, ED consultant and clinical director) or "constantly" (participant J, dental clinical director) and being mostly younger adults, Māori or Pasifika and on lower incomes, or people affected by co-morbid health conditions. They said that NTDPs ranged in severity from mild toothaches to substantial pain and facial swelling, the latter sometimes being life-threatening. A

Table 1: Participant characteristics.

	ED personnel (n=12)*	Dental personnel (n=8)
DHB A	Registered nurse (n=2) Consultant	Director, Hospital Dental Service House surgeon Specialist
DHB B	Nurse practitioner Registered nurse Director	Director, Hospital Dental Service House surgeon
DHB C	Nurse practitioner Clinical nurse specialist Consultant	Director, Hospital Dental Service House surgeon
DHB D	Nurse practitioner Registered nurse Consultant	Director, Hospital Dental Service House surgeon

*Nurse participants indicated they worked in various areas of ED, but all included triage.

few participants reported seeing "one or two (cases) a year of true Ludwig" (participant J, dental clinical director). Almost all participants commented on the considerable pressure NTDPs placed on ED. For example: "I think just the volume that comes through… and if we're busy, it puts a lot of strain on the department" (participant A, ED triage nurse).

Reasons for presenting

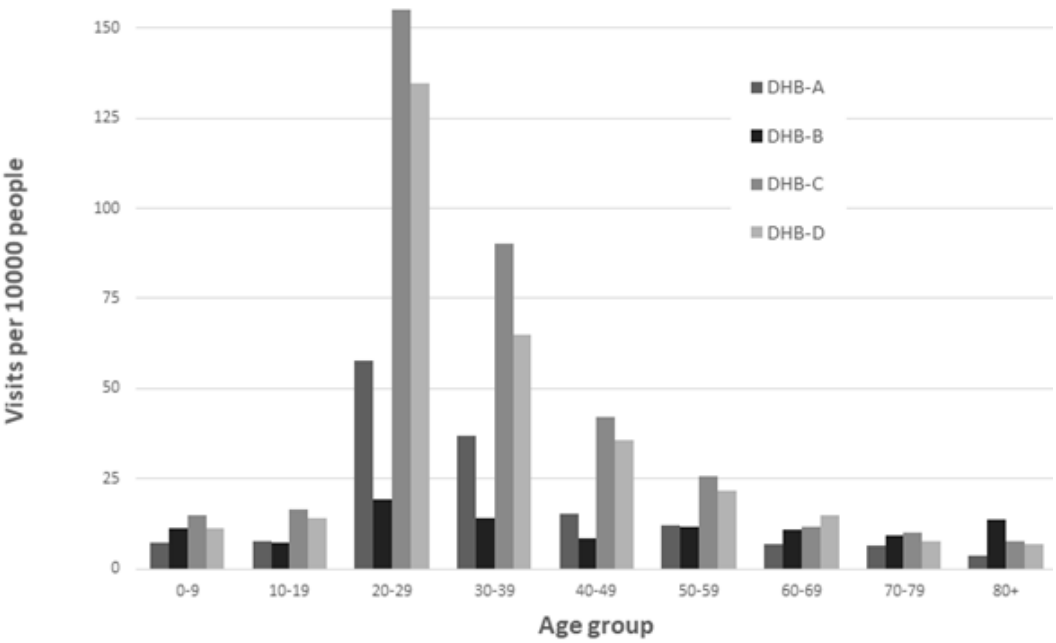
All participants were of the view that barriers to accessing dental services in the community, particularly cost, drive NTDPs to ED. For example: "I think just the cost of people accessing dental care in the communities just stops them from going regularly for check-ups" (participant A, ED triage nurse), and "dental is quite unique because… the cost is so much greater for a single visit than going to your GP… I think that is very difficult for a lot of people to plan for and to be able to afford" (participant H, ED consultant and clinical director). Several participants said that, for some patients, the financial constraints were such that occasionally patients would present after having attempted self-extraction:

> *"They can barely afford to pick up a script for $2 or $5, if you think about dental… we have had people who have self-extracted teeth… they just do it themselves 'cos they are in agony and they just come in with raging infection." – participant L, ED nurse practitioner*

Most participants reported transportation as another barrier to patients accessing community dental services and a driving factor of NTDPs at ED. For instance: "A lot of our patients come from the rural regions and with petrol and time spent to drive to… so usually there is a lot of travel involved so that is a pretty big barrier" (participant K, dental house surgeon), and "transport, income of course… that's all basically under the bracket of poverty isn't it? Yeah not having enough fuel is a common one to come in, not having a car is a common one" (participant J, dental clinical director).

Many participants also commented on the difficulty that patients (especially those with painful, acute non-traumatic dental problems) had in getting a timely appointment with a dental provider in

Figure 1: Annual ED visits per 10,000 people by age.



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the community. One explained that many patients "try all day to get in somewhere… they just can't put up with it at night, so they turn up at ED" (participant S2, dental house surgeon). A few also commented that the people who present cannot get time off work during most dentists' usual business hours:

> *"They have the kind of jobs that you can't… just not turn up, yeah people who work in factories and stuff they can't, they just can't walk off the job and take time off, and dentists don't open in the evening, so yeah I think it's really hard." – participant B, registered nurse*

The key factors driving people to ED were summarised by an ED consultant:

> *"So the most common one is they can't afford it, they can't get an appointment, and or its after hours, and there are after hours dentists but they're even more expensive and I think people don't know, again often our, so our disadvantaged populations, they don't really know how to work out how to access things either, neither can they afford it."– participant N, ED consultant and clinical director*

Consequently, participants typically concluded that, given EDs' accessibility and constant availability, it became the most viable option for dental care.

Management of NTDPs

Triage

Each ED participant was asked about their department's usual procedure for managing NTDPs; responses differed among DHBs. Although all DHBs usually referred patients with severe facial swelling to the hospital dental service or on-call dental house surgeon, not all DHBs would provide care for other types of NTDPs in ED. For instance, a dental house surgeon said that, at their hospital, "the emergency department won't see toothache unless they [ED] are very quiet and then they might give them some pain relief. But generally, they are turned away" (participant S1, dental clinical director). At other EDs, a nurse would triage patients according to the severity of the condition. All triage nurses interviewed said that patients with high triage scores (ie, lower severity) would be advised of the (usually long) wait time and the likelihood that they would not receive definitive treatment. They said some chose to stay and others would leave without being examined.

Treatment

In those EDs that accepted NTDPs for care, participants explained that patients would typically be examined by an ED nurse/nurse specialist or doctor and, if necessary, the on-call dental house surgeon would be consulted. However, all ED participants agreed that, unless the patient had substantial facial swelling, definitive treatment was not provided. Rather, patients with toothache and minor infections would normally receive analgesics and (most likely) a course of antibiotics and were left with the responsibility of arranging further care. An ED director said:

> *"Most of my job is about symptom relief when it comes to dental pain because I can't actually do much about the underlying problem because I am not a dentist… I can give a dental block; I can prescribe analgesia and I can give them antibiotics. But I am not a dentist, so I can't actually fix the underlying problem." – participant H, ED consultant and clinical director*

Doctors (and, less frequently, nurse specialists) who had skill and expertise said they might drain an abscess or administer local anaesthesia as a temporary pain relief measure.

Participants from all DHBs said that some NTDPs (usually severe facial swellings) were admitted to hospital, in either ED observation, short stay units or, on occasions, intensive care units (ICUs).

Capacity to treat

In all DHBs, the knowledge and skills of the ED staff, and the resources available, to address NTDPs appeared limited. Almost all ED nurses said that, rather than learning about dental conditions during their undergraduate training or continuing professional development, their dental knowledge and skills were driven by self-interest and learnt on the job.

Similarly, most ED doctors said they had little or no formal training in treating dental conditions, although a few commented that "dental first aid" (participant E, dental

specialist) education is now part of undergraduate medical and house surgeon training.

Dental personnel commented that severe and advanced NTDPs could be challenging to manage, especially in provincial DHBs, which have fewer specialists to manage hospital admission and require regional transfer of critically unwell patients. As one such dental director explained:

> *"[There are] some significant challenges around providing a safe level of service… because of the nature of being a rural, provincial DHB with a regional on-call system… you can't always just say we will shift them… sometimes [the reason is] medical and sometimes it's practical and these cause us more problems than the fractures… infections, you haven't got the luxury of sitting around for a couple of days to make a plan. You need to be dealing with it… they cause us… the house surgeons… everybody… a lot of anxiety, and ICU consultants to be fair." – participant S1, dental clinical director*

Definitive care

Almost all participants indicated that facilitating definitive dental care for patients differed between those people who held a Community Services Card (CSC) and those who did not. They said that at discharge they could direct patients with a CSC to seek an appointment at their DHB's relief-of-pain service, which was provided through the hospital dental service and/or contracted community-based providers and available during normal working hours. However, dental participants noted that these services were limited; that treatment need far outweighed the services' capacity to treat ("if we [hospital dental service] saw everyone with toothache we wouldn't be doing anything else" (participant O, dental director)); and that community providers in some DHBs were "over-subscribed and struggling" (participant S1, dental clinical director). Most dental participants were of the view that their service's limited capacity to provide dental care for low-income adults was pushing NTDPs into ED.

Recommendations for definitive dental care seemed more problematic for patients who were just above the eligibility threshold for a CSC and thereby not eligible for DHB-provided relief-of-pain services. Most participants said that the most they could do was advise these patients to seek definitive care with local, private dental practices—adding that patients likely could not afford those services, which is the situation that drove them to ED initially. An ED ambulatory nurse explained that "if you're in work, you're quite often not a WINZ beneficiary but you still can't afford dental treatment" (participant B, registered nurse). Other participants described such patients' challenges:

> *"This is the hardest group, the group that are working but are on low-income and don't have a Community Services Card, then they fall between the gaps completely. There are no options for them and they're the group that is really difficult to manage. So, for them, there is no pathway." – participant Q, ED nurse practitioner*

The inability to ensure patients received definitive care at discharge from ED was a source of considerable frustration for almost all participating ED and dental department personnel:

> *"I mean unless someone has a Community Services Card, or is really unwell, there is nothing else we can really do for them here in ED, it kind of feels like we are just going to help you for a little bit, but sorry there's nothing else we can do. So, it's kind of an emptyish feeling." – participant G, nurse practitioner*

> *"ED doctors are very upset about the dental presentations. They are upset because they see people in such terrible pain where they know that the provision is opiate analgesia and antibiotics and they are not actually going to solve the patient's problems. So they feel really powerless and they feel really frustrated that they will send that person back out into the community having given them analgesia and antibiotics but they know that they haven't solved the problem there." – participant E, dental specialist*

The lack of definitive care pathways for NTDPs also had ongoing implications for patients and ED. Several ED participants said they frequently see people returning to ED with the same condition, as this ED nurse practitioner explained:

> *"My spiel is that this is probably going to make you feel better but it's not going to fix your problem, and that's why I think we get people coming back and back and back, because they get relief from the pain relief and the antibiotics, and then they leave their teeth for another three weeks and then the toothache comes back." – participant L, ED nurse practitioner*

Differences between the management of NTDPs and almost all other presenting conditions were raised by several ED participants who said that dental was one of the few conditions in which eligibility for care was determined not only by the presenting condition's severity, but also by the possession of a CSC. Asked if they could think of any other conditions with similar criteria, typical responses were:

> *"No, not that I am aware of. I think everything else is usually just capacity and demand, I don't think there is anything else that… would be based on condition and illness or condition and not anything else." – participant H, ED consultant and clinical director*

> *"We wouldn't turn any medical issue away but we'd turn a dental issue away." – participant A, ED triage nurse*

Similar inconsistencies were seen in referral pathways and funding arrangements for definitive care post-ED presentation:

> *"[For other conditions] we usually have a way of referring back to their GP to refer them to a service that can that doesn't have a cost associated with it—I just don't know if there's anything we can do dentistry-wise—like literally if they do not have those Community Services Cards or facial swelling then we cannot refer them… like even with physio and people can't afford it I can refer them to the physio at the hospital for free, and there's no requirements around what they've got to do that. I can refer to hand therapy… completely free for everyone. Just nothing for dentistry." – participant L, ED nurse practitioner*

> *"I always say to the house surgeons, if I had a carpal tunnel syndrome—tingly fingers and sore arm—and there is not even a risk that it is going to flare up and become a life-threatening infection, that care is funded in New Zealand to have a carpal tunnel release. But if I have a dental problem and there is actually a risk that this could flare up and become a life-threatening infection, that care is not funded." – participant E, dental specialist*

Possible solutions

When asked how ED could be better supported to address NTDPs, strong calls were made by almost all participants for upstream strategies, particularly those that would address the barriers to patients accessing care. Subsiding dental care to improve affordability and altering the eligibility criteria for publicly funded dental care were most commonly mentioned:

> *"The Government may need to put some subsidies in where people can get cheaper dental care so that we prevent this really significant health issue for some patients; their dental stuff." – participant Q, ED nurse practitioner*

> *"Maybe if it was subsidised for longer as well and maybe if it wasn't just if you had a Community Services Card." – (participant H, ED consultant and clinical director*

Service-level solutions were also proffered. Most thought continuing education for ED personnel in dental assessments would be beneficial, and a few suggested that dental units should be established in ED. However, overall, most emergency and dental department clinical directors were not in favour of enhancing hospital-based emergency care for NTDPs. They were concerned that increasing the availability of free dental care at ED or using ED as a gateway to DHB-funded relief of pain dental care through the hospital

dental service would raise public expectations and increase the number of people seeking (affordable) extractions and dental treatment and, in turn, overwhelm hospital services. A dental director summarised the consensus view on the issue:

> *"We don't want to develop a culture which is 'turn up to ED and get free extractions'... if it's in a bigger context... take dental out of the mix and just look at what's turning up to ED... there's a big group of people who turn up to ED and use ED as their primary care doctor, either because they can't afford to go to primary care or they choose not to or they can't get in... it's the same problem for dental... we don't want to drive this behaviour which is part of a bigger picture." – participant S1, dental clinical director*

Providing out-of-hours relief-of-pain clinics for eligible patients (ie, those with a CSC) or providing a dentist at urgent medical centres were suggested by most dental department participants.

Given almost all NTDPs are preventable, the consensus among participants was that early intervention and prevention measures were key to reducing NTDPs at ED and the subsequent strain on hospital services. Responses from an ED consultant and a dental director were typical:

> *"By the time people present with dental pain, often you've missed the boat a little bit. So, I think all the health prevention measures to try to maintain good oral health is probably way more important." – participant H, ED consultant & clinical director*

> *"There isn't another pathway for them [patients], and that's why they're turning up to ED, so making ED better is a very downstream approach to that, rather than actually why are they coming to ED, instead of more appropriately either having no dental disease, or seeing a dentist earlier in the piece." – participant O, dental director*

The majority of ED personnel were of the view that ED "seems inappropriate" (participant B, registered nurse) as a setting to address NTDPs. Rather, they thought the management of NTDPs lay in the primary care setting:

> *"It's a bigger problem than just ED, and the more it's focused in primary health the better really." – participant M, ED registered nurse*

> *"This stuff is getting more severe than it needs to be before it's dealt with and therefore, we end up dealing with situations at a secondary level and they really should be being dealt with at primary care. And they are not." – (participant S1, dental clinical director*

Additional solutions participants suggested are in Supplementary Table 2.

Discussion

This study investigated the nature of non-traumatic dental presentations to emergency departments, and the context in which they are managed, at four diverse New Zealand DHBs. A high proportion of NTDPs were made by young Māori and Pasifika men seeking relief of toothaches and/or dental abscesses. Although most people were "treated and discharged," about one in five were admitted, mainly to short stay units, but also occasionally to ICU. The nature and extent of NTDPs found in this study confirms previous anecdotal and media reports[3–6] of New Zealanders attending ED for relief of dental-related pain and infections and are consistent with previous international research.[7–13] The high proportion of NTDPs admitted in the DHB that provided admissions data is also of a magnitude similar to those reported elsewhere[13] and is indicative of late presentation and the severity of presenting conditions. Although we did not analyse admission data by demographic characteristics, previous New Zealand research has found that almost one-third of dental hospital admissions for 18–34 year olds are acute dental conditions,[22] with the rate for Māori and Pasifika being twice that of NZ Europeans. Our findings also align with national data that show young adult New Zealanders, Māori, Pasifika and those living in more deprived areas of the country have significantly poorer oral health, lower use of dental services and greater unmet dental need, and only seek treatment when they have a

problem, than other age groups, non-Māori, non-Pasifika and the least deprived.[16, 19]

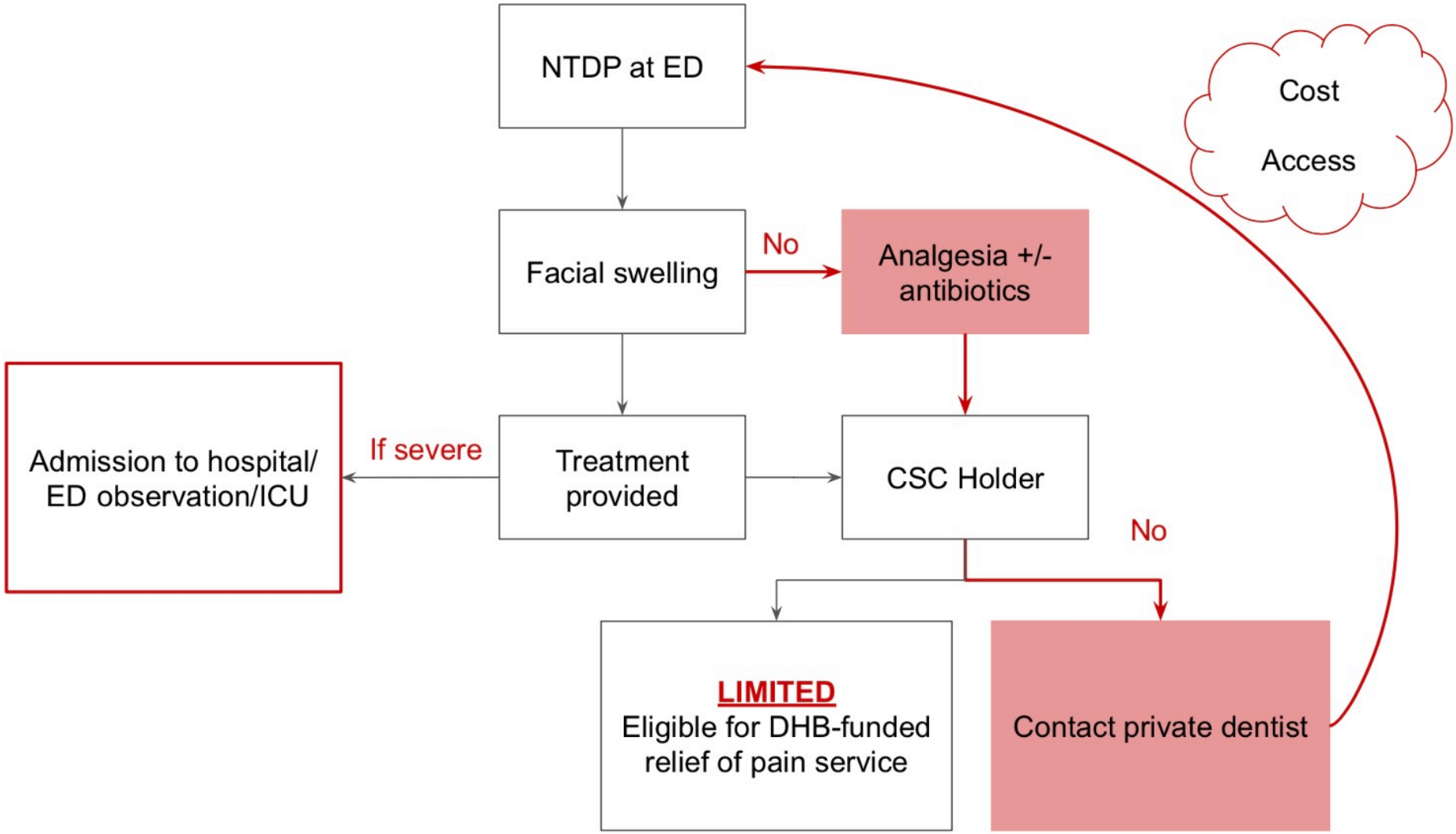
Barriers to accessing private dental care, particularly cost,[16,18] appear to drive NTDPs to ED. Internationally, dental-related ED visits are reported most frequently among lower-income groups.[7,10] We did not investigate the occurrence of NTDPs against income or socioeconomic status as this was outside the scope of the research and we did not have available data. However, New Zealanders with the highest proportion of low household incomes are the same as those in this study who presented most commonly to ED: 18–24 year olds, Māori and Pasifika.[23] Participants in this study were concerned about those who are just above the eligibility threshold for DHB-funded relief of pain dental care (that is, those who are 'in-work' but have insufficient disposable income to pay for treatment by a private dental practitioner). Senior hospital dental personnel recently expressed similar concerns.[24] Income inequality and in-work poverty in New Zealand has become increasingly apparent in recent decades, particularly among Māori and Pasifika.[23,25] Despite living in working households, approximately 10% of New Zealanders—and almost double that for Māori and Pasifika—live in poverty.[23] Further, Māori and Pasifika are disproportionately impacted by in-work poverty, with rates almost double (8.6% and 9.5%, respectively) that of NZ Europeans (5.9%) and other ethnic groups (5.5%).[23] Consequently, the capacity of those in work but on low incomes to afford dental care is severely reduced.

District health boards are required to provide emergency dental services to relieve dental-related pain and infection for low-income adults, as capacity allows.[24] However, the capacity of hospital dental departments to provide such services is reducing, owing to the high rates of presentation and referral of frail older and medically compromised people, groups who require hospital-level and specialist dental care and who, as such, are prioritised by the hospital dental services.[24] As found elsewhere,[9,11,13] the busiest times in ED for NTDPs were weekends and after hours, suggesting that, regardless of affordability, dental services (be they at a DHB or private dentist) are not accessible at times convenient to patients' work or family commitments.

The provision of symptomatic treatment for most NTDPs, other than severe dental-related facial swelling, and the inability of ED staff to provide definitive care found in this study are also consistent with investigations elsewhere.[7–9,14] Owing to the growing public health issue of antibiotic resistance, antibiotic therapy is neither warranted nor recommended[26,27] for most dental complaints; use of antibiotics is recommended only in cases where infection is more widespread.[28] Although largely driven by dental practitioners,[29,30] medical practitioners also contribute to dental-related antibiotic resistance. It is estimated that antibiotics are prescribed for up to two-thirds of those presenting to ED with dental conditions.[31,32] Although not identified by participants in this study, drug-seeking, particularly for opioids, is an additional concern when addressing NTDPs in ED.[32,33] Consequently, calls have been made for dental and medical practitioners, and other health professionals, to carefully consider prescribing antibiotics for NTDPs.[26,34]

The most effective means of relieving pain and infection and reducing antibiotic prescribing is operative intervention, such as extraction or pulp therapy.[27] However, for most ED staff in this study, facilitating such care was problematic and frustrating, given a lack of resources, and dissatisfaction with a system that did not enable them to deliver definitive care and that differed from those for almost all other presenting conditions. As most participants noted, the lack of resolution of the underlying dental problem generated a futile cycle of repeat presentations (summarised in Figure 2). Sun et al described a similar cycle, with patients being shuffled back and forth between ED and private dental clinics, and eventually relying solely on ED for care.[8] As observed by some participants in our study, chronically untreated dental disease can result in dangerous and life-threatening outcomes, such as patients attempting to extract their own teeth, or presenting with critical facial swellings that require admission to hospital, or management in intensive care units. Although deaths resulting from conditions of dental origin were not found in this study, other countries report such outcomes.[10,35]

Figure 2: Summary of ED NTDP care pathways.



Dental-related pain and infection can severely impact patients' and whānau wellbeing and quality of life. NTDPs place pressure on ED staff and hospital systems, especially in New Zealand's less-well-resourced small and provincial DHB regions. Despite NTDPs making up a relatively small proportion of all hospital presentations, they should not to be underestimated, as their consequences are likely considerable.[9,12,14] Proportionally, visits for dental-related conditions are of a similar magnitude to those for asthma, and greater than those for the complications of diabetes and hypertension.[9] Further, Brondani and Ahmad highlighted the "ineffective… fiscally irresponsible" use of public funds in merely providing symptomatic treatment and discharging patients without definitively treating the condition, with a high likelihood they will return seeking relief of pain for a condition with greater severity. In New Zealand in 2018, the cost of an outpatient visit to ED was estimated to be NZ$370.00, a stay on a hospital ward NZ$1,200/day and a stay in ICU NZ$5,500.00/day, and 490,452 New Zealand adults reported using ED at least once.[36] Assuming 1% of those people attended for a dental-related complaint, the estimated cost, based on outpatient treatment only, would be approximately NZ$1.8M. This is likely to be a substantial underestimation given it does not account for repeat visits or the costs associated with day and ICU stays, NTDPs at general medical practices and pharmaceuticals. Further cost analyses are warranted to better understand the fiscal impact of NTDPs.

Inconsistency in the recording and availability of information among DHBs is another key finding of this study. Codes and descriptions for dental diagnoses and treatments, and the information requested, differed among the DHBs. Many diagnoses were unspecific, and some appeared to be coded in error. In addition, some treatments associated with dental diagnoses were unrelated to dental issues. In their study, Sun et al found a similar lack of detail in dental discharge diagnoses in ED, and this may have reflected ED-provider uncertainty in managing dental problems.[8] Similar inconsistencies in data collection and availability also occur within the hospital dental service nationally.[24] Not only is the variability in the recording of ED data challenging when undertaking analyses, but it is also problematic when planning services and associated budgets and when informing actions for improvement. There is clearly a need to ensure greater accuracy and consistency in the recording of dental data within, and among, New Zealand hospitals.

Strengths and limitations

To the best of our knowledge, this is the first investigation of NTDPs at EDs in New Zealand hospitals. The mixed-methods approach is a strength of the research; the two arms of the study allowed for a more comprehensive understanding of the issue than either alone. Further, the findings from the two approaches were mostly congruent, which strengthens the trustworthiness of the findings overall. More than one interviewer was present at each interview; interviewers were trained to ensure consistency across the DHBs; and interview transcripts were reviewed by all investigators, with interpretation agreed by discussion, which adds to this study's rigour.

The study also has some limitations. Only four (20%) of New Zealand's 20 DHBs were included. It is possible that the nature of NTDPs at the remaining DHBs, and the context in which they are managed, differ from those found in this study. However, the participating DHBs were selected to ensure a diverse sample. In addition, the consistency of the findings among all four DHBs and findings from previous research on New Zealand's hospital-based oral health services[24] support the likelihood that the nature of NTDPs, their management in other hospital EDs and participants' concerns found in this study are similar at other DHBs, and that our findings are applicable nationally.

Our findings are limited to NTDPs at hospital EDs; people also present to medical centres and after-hours urgent care practices for relief of dental-related pain and infection, and those agencies are equally ill-equipped to manage NTDPs.[37,38] Therefore our analyses likely underestimate the extent of unmet need in the communities in our study. Further investigation of NTDPs to primary medical care and other health providers, such as pharmacies, is warranted. Patients must be at the centre of healthcare delivery; the lack of the patient voice is a

gap in this research. Capturing the patient perspective would provide a deeper understanding of the issue and much needed evidence to inform the development of appropriate services and drive system change.

Implications for policy and practice

According to the New Zealand Ministry of Health,[39] while "EDs provide episodic 'crisis care'… primary health care services are the principal providers of both routine and urgent health care," and if it is better suited to a patient's needs, the patient should be referred to primary healthcare providers. Our findings support previous research that found that primary care in the community is the most appropriate, effective and favoured setting in which to resolve people's urgent dental needs.[13,17,22,24] Consideration should be given to funding the re-orientation of oral health services to establish community-based relief-of-pain services or contract private dentists to provide affordable (and after-hours) dental care to low-income individuals. This strategy, in addition to addressing unmet dental need within communities, would also provide viable referral avenues for NTDPs and reduce inappropriate antibiotic prescribing, strain on ED and associated health system costs. Requiring general dental practitioners to provide after-hours care, as is expected of general medical practitioners, should also be considered. Dentists could work collectively with their medical colleagues in general practice to integrate dental services into after-hours medical care facilities.

Dental-related hospital admissions for young adults, Māori and Pasifika and the most deprived increased between 1990 and 2009,[22] and have likely continued to increase. If the means and the political will to provide affordable dental care in New Zealand are not found, then oral health disparities in New Zealand are likely to continue and to widen. To mitigate the impact of acute dental disease, there is an urgent need to implement appropriate, accessible, affordable and equitable emergency and routine dental care services in New Zealand.[22] This could be advanced by considering oral health in the development of New Zealand's new health system. Intervening early, through routine dental care supported by upstream approaches, would likely avert many NTDPs to ED. Progression of New Zealand's oral health strategy[40] at national and regional levels, with a strong focus on equity, is essential for guiding such actions.

Supplementary material

- Supplementary Table 1: NTDPs at ED, by diagnosis and by attending clinician
- Supplementary Table 2: Participants' proposed solutions to reduce NTDPs at ED

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Nil.
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