A review of Healthdirect's telephony and digital medication services

Centre for Health Systems and Safety Research

Australian Institute of Health Innovation

2015

Suggested citation:

Baysari MT, Li L, Tariq A, Raban MZ, Lake R, Richardson L, Westbrook JI. A review of Healthdirect's telephony and digital medication services. Centre for Health Systems & Safety Research, Australian Institute of Health Innovation, Macquarie University, March, 2015.

This report was commissioned by Healthdirect Australia.

Executive summary

We adopted a multi-method approach comprising interviews with stakeholders, a detailed analysis of medication query calls made to Healthdirect in 2014, an audit of free text inputted by telephone providers (triage nurses and GPs) in November 2014, a human factors analysis of current telephone practices and guidelines, a gap analysis of Healthdirect's website, and user testing of Healthdirect's website, to evaluate Healthdirect's current medication-related services. Overall, Healthdirect's telephone service and website represent some of the most comprehensive and accessible resources available to consumers to obtain medication information. This is primarily because 1) the telephone line operates 24 hours a day and offers consumers customised advice and information; and 2) the website refers consumers to external websites for information, allowing users to gain access to a wide range of medication information, more information than any other single website.

Despite these advantages, we identified a range of ways in which the telephone service and website could be improved. In particular, the telephone triage process and use of medication guidelines could be streamlined, automated and made more user-friendly for telephone providers. The website's search functionality, search outputs and some content could also be modified to provide users with an easier and more efficient website experience.

Regular consumer engagement is critical for managing and improving the quality of Healthdirect's medication-related services. In implementing changes to Healthdirect's telephone and digital services, the adoption of a user-centred approach would be valuable.

CONTENTS

HEALTHDIRECT AUSTRALIA

Healthdirect Australia provides Australians with access to health advice and information using telecommunications and online technologies. They provide free access to advice and information, including medication-related advice and information, via four main avenues: i) a 24-hours telephone health triage service, ii) an after hours GP helpline, iii) a Pregnancy Birth and Baby helpline, and iv) a website (www.healthdirect.gov.au).

OBJECTIVES OF RESEARCH

The objectives of this project were to:

1. Examine how Healthdirect are currently providing their telephone services to callers with medication-related queries. Identify if improvements are required and how they may be achieved

2. Examine the service Healthdirect currently provides to consumers who come to their website with medication queries and identify what additional services/tools they could provide to better address these information needs

3. Develop a strategy for achieving these improvements

RESEARCH STUDIES

To achieve research objectives, five complementary studies were performed. These included:

1. Consultation with stakeholders
2. Audit and analysis of medication query calls
3. Review and analysis of current telephone practices and guidelines
4. Gap analysis of Healthdirect's website
5. User testing of Healthdirect's website

STUDY 1: CONSULTATION WITH STAKEHOLDERS

AIM

To identify current avenues for consumers to obtain medication advice including the identification of any gaps in available medication information that could be filled by Healthdirect's services.

METHOD

Participants

Healthdirect assisted in the identification of six stakeholders from relevant agencies. These were the National Prescribing Service (NPS), Clinical Excellence Commission (CEC), Healthdirect Australia, ACT Health, Consumers Health Forum of Australia, and the Pharmaceutical Society of Australia. Researchers contacted potential participants via telephone and invited them to take part in an interview. All six participants agreed to take part.

Procedure

Following informed consent, a short semi-structured interview was held with stakeholders over the telephone. Interview questions (Appendix 1), served as a guide and were adapted depending on their relevance to the specific stakeholder interviewed.

RESULTS

Participants worked in a range of organisations and held a wide range of roles, but several key themes emerged from our analysis of interviews. These were: 1) information overload; 2) problems with Consumer Medicine Information (CMI); 3) easy to understand information; and 4) telephone helplines and mobile applications.

Information overload

Several participants identified information overload as a barrier to consumers obtaining relevant medication information. This was discussed in the context of searching for information on-line or on particular websites.

"So when I've put in my search…instead of coming up with clear information and an answer it comes up with 800 articles. Now, that is not the way that people want to observe information because you need to, one, have the time and patience to read

through all of that and the critical analysis skills to be able to identify the information you needed in it, and that's really difficult". (SH4)

It was stressed that consumers do not have the know-how (health literacy) to be able to filter content and identify the most relevant information.

"People don't even realise often that they're just looking at blogs and forums, that if it sounds sort of professional, so that's certainly something that we would try and build into our QUM messaging when we're speaking to people, is understanding the risks of looking on the web and we've got some content on our website just to try and help educate people about some of the tips on Internet searching". (SH2)

Problems with Consumer Medicine Information (CMI)

Nearly all participants raised the subject of CMI leaflets. Some participants felt that CMI leaflets contain too much information.

"CMI sometimes are too much – too many words going on and they just get a bit overwhelmed". (SH1)

One participant explained that if content is to be read and to be meaningful, it needs to be reduced so that only relevant information is included.

"So if you look across a range of CMI you'll see that in the potential side-effects section, or potential adverse events, however they word it, that they list 50 different things and by listing 50 different things the effect on the consumer is they glance at it and don't take it seriously" (SH4)

Several stakeholders also discussed the relevance of CMI content to average consumers: older patients with comorbidities taking many medications.

"CMI is developed in a perfect world where a patient's only taking that medication, when in actual fact most patients who are taking the medication are taking multiple medications". (SH4)

"It's that whole process of how drugs get onto the market and how they're trialed and tested, and the fact that information might be really almost irrelevant for a particular

age group or people with comorbidities and they're people that we're generally dealing with who've got other issues". (SH2)

Information that is easy to understand

One of the key barriers to consumers obtaining accurate and timely medication information was identified to be the understandability of information.

"Well I think one of the things is trying to do it in the language that people can understand. A lot of the sources … use quite, almost, scientific or medical language, which the common user out there…will not understand". (SH3)

Telephone helplines and mobile applications

When asked to discuss the best resources available for consumers to obtain medication information, most participants mentioned pharmacists and other healthcare providers. But telephone helplines were viewed as the next best thing. This was because telephone providers deliver customised information (individualised and tailored to a consumer's health literacy level), are available to remote consumers (with limited access to face-to-face providers and/or the internet) and typically run 24 hours a day.

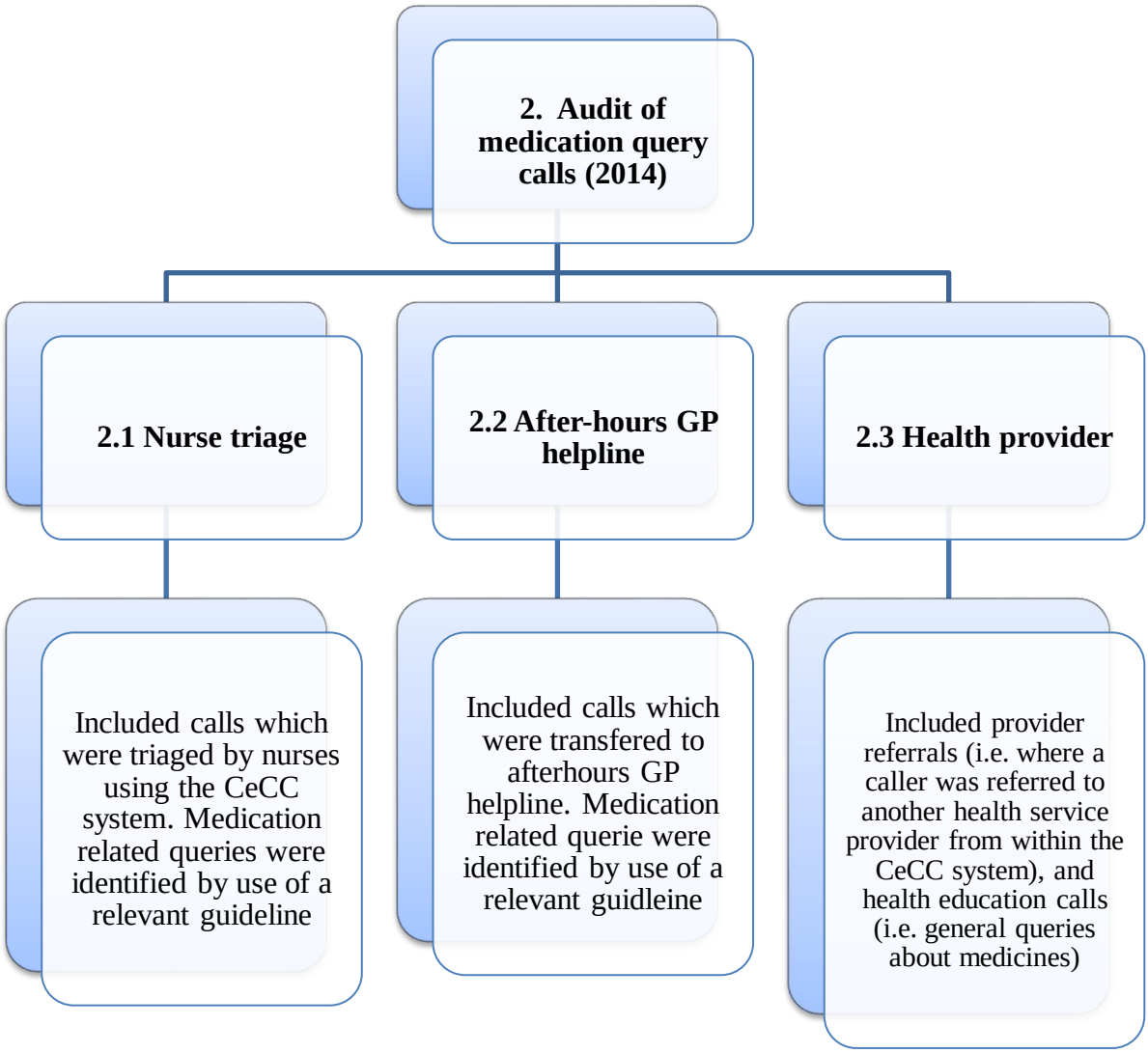
"I think the critical point is that people are able to access information, quality information … fairly easily and quickly and to then be able to be moved on through the system or to get advice as to how to move on through the system, or what to do next, in a reasonably timely fashion." (SH6)

Use of mobile applications for quick and personalised access to medication information was also identified as a potential avenue to improve the consumer experience.

"I've had some patients actually come in who are in their 70s and they've got the NPS app on their phone with their med list in it there in that way. So I have seen that a number of times". (SH1)

STUDY 2. AUDIT OF MEDICATION QUERY CALLS

In this study we audited telephone data for medication-related queries received by Healthdirect during 2014. Three distinct data sets were provided for analysis, each associated with a different type of service provided by Healthdirect, as shown below.



Study 2.1 Analysis of nurse triage medication calls

INTRODUCTION

A significant proportion of callers to the Healthdirect telephone triage and advice line are seeking advice about medications. This study examined nurse triage medication calls made to HealthDirect in 2014. There were two main components to this study: 1) overall profile of 2014 nurse triage medication calls and 2) medications involved in the November nurse triage calls.

METHOD

We conducted a detailed descriptive analysis of 2014 data over time, specifically examining volume of medications calls, user profile for patients and callers (including age, gender, cultural background and frequent users), and call characteristics (including time of call, patient outcomes, and duration of calls).

For component 2, we focused on November data and analysed the free-text patient presenting problems (in data field "NT_PRESENTING_PROBLEM"), which were recorded by nurses during the calls. Data from the 1835 medication-related calls were analysed. From this free-text field, we identified:

1) Medications involved in each call. We then used the MIMS database to classify the medications into their respective generic names and MIMS categories. Where the medication was misspelt or incorrect and produced no result from MIMS, efforts were made to identify the medication by entering only part of the misspelt name and searching for results. Despite this, not all medications were identified.
2) Whether the information in the patient presenting problem field was consistent with the patient question selected from a drop-down list by nurses. If inconsistent, we re-grouped the call into one of the Healthdirect patient question categories.
3) Technical difficulties (i.e. when the eMIMS service was unavailable). There did not appear to be a formal process for nurses to record these problems. We searched for references to 'MIMS,' 'eMIMS,' as well as words like 'access'

and ‘online,’ in the free-text comments made by nurses to identify any technical issues with MIMS.

Based on the data extracted from the patient presenting problems, we analysed the frequency of medications by their generic names and MIMS categories, and the distribution of the number of medications involved in the nurse triage calls by patient age, gender, call final disposition and duration.

COMPONENT 1 RESULTS

Volume of medication calls in 2014

Medication calls over time

In 2014, there were 675,774 calls recorded in the nurse triage database. The largest number of calls were made in January, followed by August, March and December. Among these calls, 25,744 calls (3.81%) were medication-related calls (Table 2.1.**1**). The percentage of medication calls in each month varied from 3.36% to 4.15%. April, May and June had the highest proportion of medication calls (Figure 2.1.**1**).

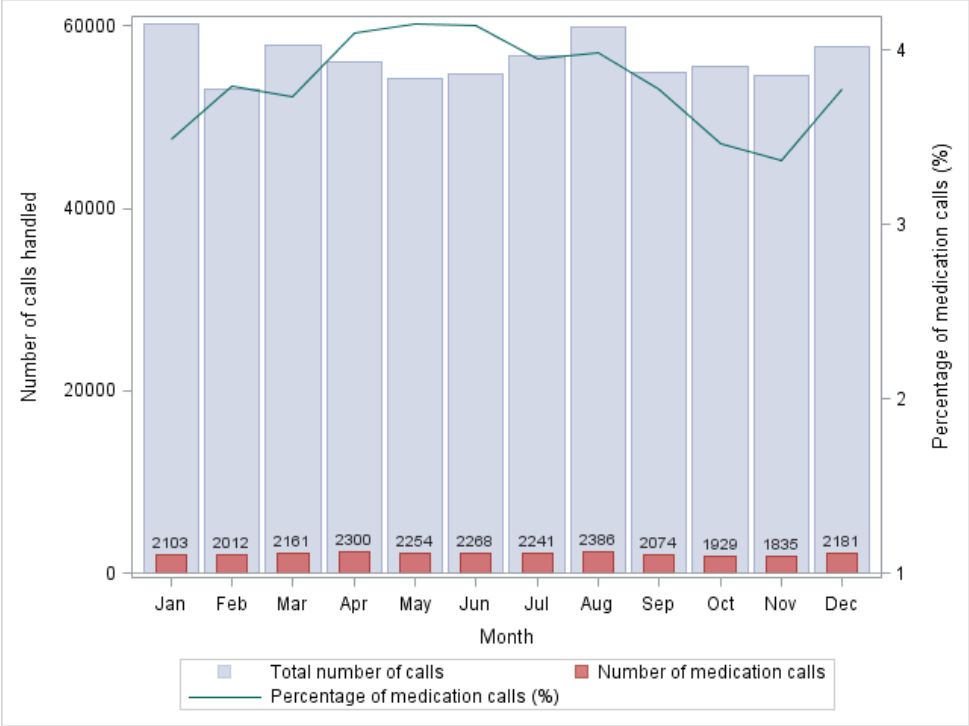


Figure 2.1.1 Nurse Tirage calls and medication calls over time in 2014

Table 2.1.1 Volume of medication calls in the nurse triage 2014 data

Month	Number of medication calls (% of calls)	Total number of calls
Jan	2103(3.49)	60,251
Feb	2012(3.79)	53,064
Mar	2161(3.73)	57,862
Apr	2300(4.10)	56,074
May	2254(4.15)	54,293
Jun	2268(4.14)	54,736
Jul	2241(3.95)	56,692
Aug	2386(3.99)	59,861
Sep	2074(3.77)	54,968
Oct	1929(3.47)	55,653
Nov	1835(3.36)	54,533
Dec	2181(3.77)	57,787
Total	**25,744(3.81)**	**675,774**

Paediatric and adult medication calls over time

Of all medication calls, 15.95% related to paediatric medications and 84.05% related to adult medications (Table 2.1.**2**, Figure 2.1.**2**). The colder months (from June to September) had the highest percentage of paediatric mediation calls.

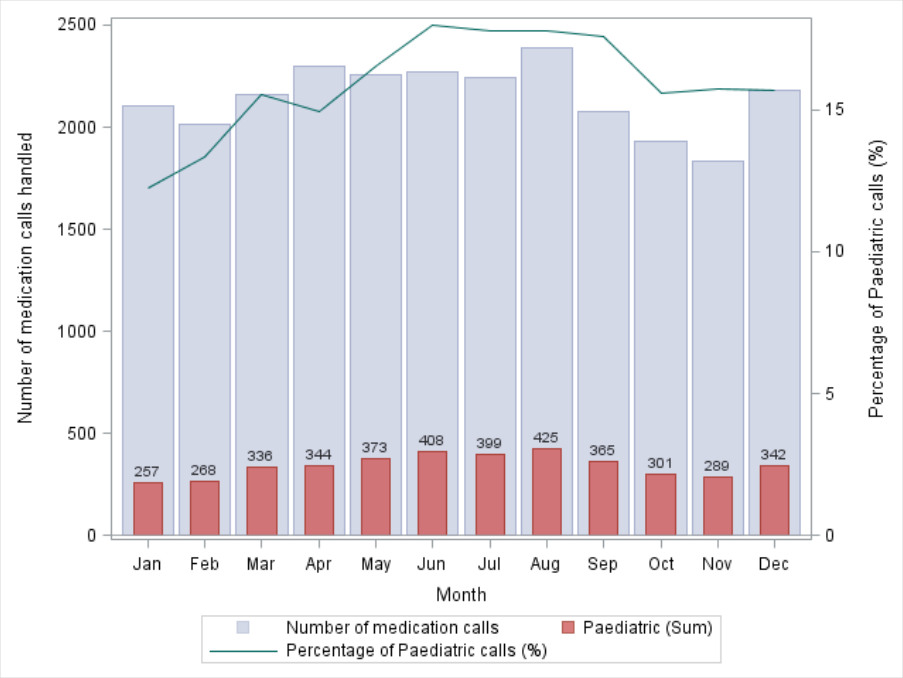


Figure 2.1.2 Paediatric and adult medication calls over time

Table 2.1.2 Paediatric and adult medication calls over time

Month	Number of paediatric Medication calls	Percentage of Paediatric calls (%)	Number of adult medication calls	Percentage of adult calls (%)	Number of medication calls
Jan	257	12.22	1846	87.78	2103
Feb	268	13.32	1744	86.68	2012
Mar	336	15.55	1825	84.45	2161
Apr	344	14.96	1956	85.04	2300
May	373	16.55	1881	83.45	2254
Jun	408	17.99	1860	82.01	2268

Jul	399	17.80	1842	82.20	2241
Aug	425	17.81	1961	82.19	2386
Sep	365	17.60	1709	82.40	2074
Oct	301	15.60	1628	84.40	1929
Nov	289	15.75	1546	84.25	1835
Dec	342	15.68	1839	84.32	2181
Total	**4107**	**15.95**	**21,637**	**84.05**	**25,744**

Calls by state over time

In 2014, half of the medication-related calls (50.85%, n=13,090) were made from patients in NSW (Table 2.1.**3**). The majority of calls were from NSW, WA and SA (83.06%). Across the 12 months, the distributions of calls for these three states were very similar (Figure 2.1.**3**). Overall, August had the greatest proportion of medication-related calls in the year (9.27%) and November had the smallest proportion (7.13%).

Table 2.1.3 Medication calls by state

State	Number of calls	Percent
NSW	13,090	50.85
WA	4,428	17.20
SA	3,865	15.01
Unknown	1,719	6.68
TAS	1,290	5.01
ACT	965	3.75

NT	292	1.13
VIC	76	0.30
QLD	19	0.07
Total	25,744	100.00

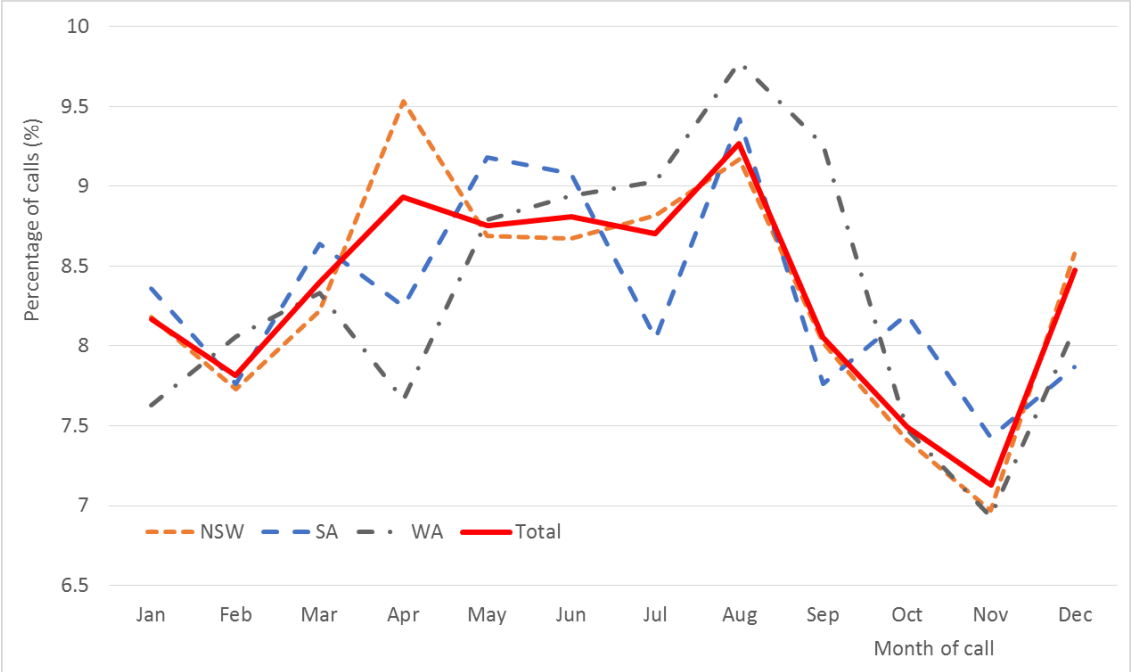


Figure 2.1.3 Medication calls over time and by main states

User profile

Caller relationship to patients

In 2014, 73.06% (n=18,808) of medication calls were made by patients; 14.09% (n=3837) were made by the parent of a patient (Table 2.1.**4**).

Table 2.1.4 Caller relationship to patient

Caller relationship to	**Number of calls**	**Percent**

patient		
SELF	18,808	73.06
is parent of	3,837	14.90
is other relative of	1,204	4.68
is employee of	1,166	4.53
is carer of	588	2.28
is other of	141	0.55
Total	25,744	100.00

Age

Patient age

Patients aged between 26 to 65 years were the most frequent users of the service (56.44%, Table 2.1.**5**).

Table 2.1.5 Medication calls by patient age

Patient age	Number of calls	Percent
Missing	4	0.02
<1 year	995	3.86
1-4 years	1,808	7.02
5-9 years	752	2.92
10-14 years	524	2.04
15-25	3,085	11.98

years		
26-45 years	9,134	35.48
46-65 years	5,397	20.96
>65 years	4,045	15.71
Total	25,744	100.00

Caller age

There were 169 callers under the age of 18 years (Table 2.1.**6**).

Table 2.1.6 Medication calls by caller age

Caller age	**Number of calls**	**Percent**
Missing	433	1.68
<18	169	0.66
>=18	25,142	97.66
Total	25,744	100.00

Gender

Patient gender

The majority of patients (67.85%) were female (Table 2.1.**7**).

Table 2.1.7 Medication calls by patient gender

Patient gender	Number of calls	Percent
Female	17,467	67.85
Male	8,268	32.12
Other	9	0.03
Total	25,744	100.00

Caller gender

The majority of callers (77.23%) were female (Table 2.1.**8**).

Table 2.1.8 Medication calls by caller gender

Caller gender	Number of calls	Percent
Female	19,881	77.23
Male	5,810	22.57
Other	53	0.21
Total	25,744	100.00

Cultural background

Aboriginals and/or Torres Strait islanders made 947 calls (3.68% of all medication calls, Table 2.1.**9**).

Table 2.1.9 Medication calls by cultural background

Cultural background	Number of calls	Percent
Aboriginal	913	3.55
Both Aboriginal and Torres Strait Islander	15	0.06
Declined	2,006	7.79
Non Indigenous	22,790	88.53
Torres Strait Islander	19	0.07
Unknown	1	0.00
Total	25,744	100.00

Frequent users

Callers

In 2014, 23,254 people made medication-related calls. Most people made a single medication-related call (93.24%, n=21,683) but 110 people made five or more mediation-related calls (Table 2.1.**10**).

Table 2.1.10 Frequency of service used by callers

Number of times called	Number of callers	Percent
1	21,683	93.24
2	1,165	5.01
3	225	0.97

4	71	0.31
5-19	110	0.47
Total	23,254	100.00

Patients

In 2014, 23,254 patients were the subject of medication-related calls. Most patients only used the service once (93.97%) and 102 patients used it five or more times (Table 2.1.**11**).

Table 2.1.11 Frequency of service used by patients

Number of times called	Number of patient	Percent
1	22,070	93.97
2	1,057	4.5
3	193	0.82
4	65	0.28
5-19	102	0.42
Total	23,487	100.00

Call characteristics

Time of calls (time of the day, day of the week)

The number of calls was distributed evenly across weekdays. Wednesdays (15% of calls) were relatively busy and Sundays (12.76%) were relatively less busy (Table 2.1.**12**).

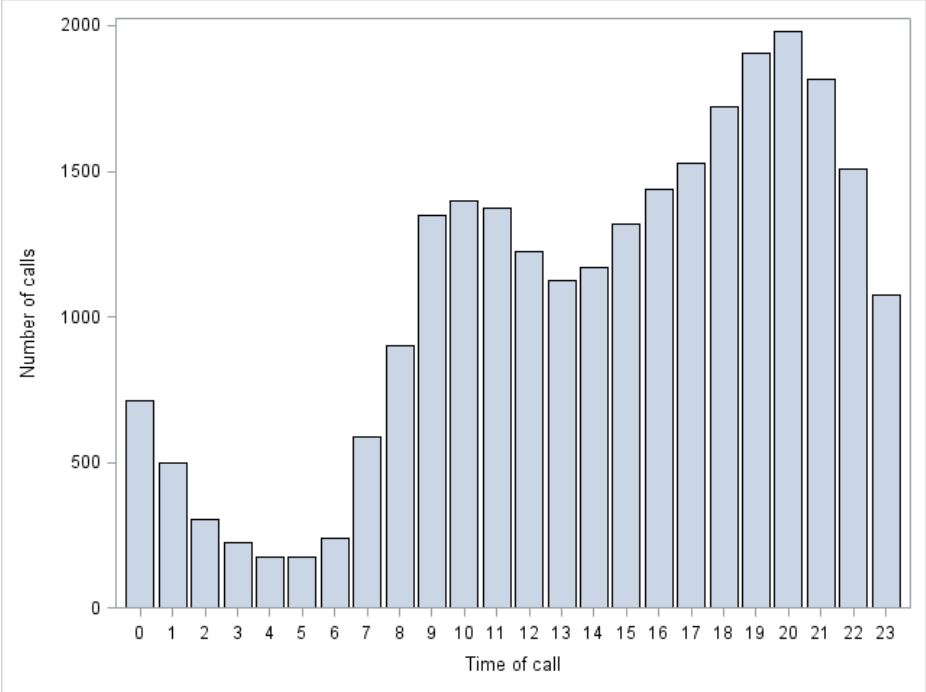
Table 2.1.12 Medication calls by day of week

Weekday	Number of calls	Percent
Mon	3,788	14.71
Tue	3,693	14.35
Wed	3,861	15.00
Thu	3,561	13.83
Fri	3,811	14.80
Sat	3,745	14.55
Sun	3,285	12.76
Total	25,744	100.00

More than half of the calls (56.12%) were made after business hours, i.e. from 17:00 to 8:00. The busiest hours were 17:00-22:00 with 21.35% of all medication calls made during this period (Table 2.1.**13**).

Table 2.1.13 Medication calls by time of day

Time of call	Number of calls	Percent
8:00-17:00	11,295	43.87
17:00-22:00	8,952	34.77
22:00-8:00	5,497	21.35
Total	25,744	100.00



Call back

No call was scheduled for a call back service.

Patient intentions and dispositions

Caller original intentions

For nearly one third of calls (28.97%), callers reported that did not know what to do when they called (Table 2.1.**14**).

Table 2.1.14 Medication calls by caller original intentions

ORIGINAL_INTENTION	Number of calls	Percent
Did not know what to do	7,458	28.97
Contact Doctor/Healthcare Provider	6,017	23.37
Home/Self Care		20.21

	5,202	
Unknown	3,657	14.21
Attend Emergency Department	1,087	4.22
Other Healthcare Provider (Non GP)	866	3.36
Non-Professional Advice	545	2.12
See GP Business Hours	454	1.76
See GP After Hours	200	0.78
000 Ambulance	190	0.74
No GP or GP Appt Available	68	0.26
Total	25,744	100.00

Patient final dispositions

More than half of the calls (55.40%) ended with the advice of home/self care and 42.47% of calls ended with the advice of seeing a health provider/doctor within 24 hours (33.07%+8.22%, Table 2.1.**15**).

Table 2.1.15 Medication calls by patient final dispositions

Patient final disposition	Number of calls	Percent
Provide Home/Self Care	14,263	55.40
See appropriate Health Provider within 24 hours	8,514	33.07
See Doctor within 24 Hours.	2,115	8.22
Call Poisons Information Centre Immediately	850	3.30
See Doctor within 4 Hours.	1	<0.01
See Doctor within 72 Hours.	1	<0.01
Total	25,744	100.00

Original intentions and final dispositions (highlighted rows are row percentages)

Of 6017 calls with the original intention of "contact doctor/health provider" prior to calling Healthdirect, 52.87% received this advice or similar from the telephone provider, i.e. see health provider/doctor or call poisons information centre immediately. The remaining callers (47.13%) were given the advice of home/self care (Table 2.1.**16**).

Of 5202 calls with the original intention of "home/self care", 62.21% were given this advice and the remaining callers (37.79%) were advised to see a health provider/doctor.

There were 1277 calls with the original intention of attending an Emergency Department or calling an ambulance where other advice was given.

Table 2.1.16 Medication calls by caller original intentions and patient final dispositions

Original intentions	**Patient final dispositions**					
	Provide Home/Self Care	See appropriate Health Provider within 24 hours	See Doctor within 24 Hours.	Call Poisons Information Centre Immediately	See Doctor within 4 Hours	See Doctor within 72 Hours
Did not know what to do	4238	2405	556	259	0	0
(row percent)	56.82	32.25	7.46	3.47	0	0
Contact Doctor//Healthcare Provider	2836	2469	607	104	0	1
(row percent)	47.13	41.03	10.09	1.73	0	0.02
Home/Self Care	3236	1454	350	161	1	0
(row percent)	62.21	27.95	6.73	3.09	0.02	0
Unknown	2115	1181	273	88	0	0
(row percent)	57.83	32.29	7.47	2.41	0	0
Attend Emergency Department	630	215	130	112	0	0
(row percent)	57.96	19.78	11.96	10.3	0	0
Other Healthcare Provider (Non GP)	440	337	43	46	0	0

(row percent)	50.81	38.91	4.97	5.31	0	0
Non-Professional Advice	350	157	21	17	0	0
(row percent)	64.22	28.81	3.85	3.12	0	0
See GP Business Hours	191	194	53	16	0	0
(row percent)	42.07	42.73	11.67	3.52	0	0
See GP After Hours	114	38	32	16	0	0
(row percent)	57	19	16	8	0	0
000 Ambulance	91	32	36	31	0	0
(row percent)	47.89	16.84	18.95	16.32	0	0
No GP or GP Appt Available	22	32	14	0	0	0
(row percent)	32.35	47.06	20.59	0	0	0
Total	14263	8514	2115	850	1	1

Duration of calls

Five calls were excluded from this section of analysis due to invalid or implausible values (missing session end time (n=1), session end time earlier than session start time (n=2), or implausible length of calls: one lasted more than 120 hours, the other one longer than 24 hours).

The duration of calls varied from 2 to 55 minutes with an average length of 10 minutes (median 9 with the interquartile range (IQR) from 7 to 12 minutes). There were no/little differences in the duration of calls by other related characteristics, including patient demographics (such as age, gender, and state), caller relationship to patient, patient final disposition, caller's age, gender and time of calls.

COMPONENT 2 RESULTS

By generic names

We were able to classify 2156 (85.02%) medications into 384 generic names. The most frequent generic names were paracetamol (n=207 times for 8.2% of all medications involved in the nurse triage medication calls), followed by ibuprofen (n=112, for 4.4% of medications), and paracetamol and codeine (n=59, for 2.3% of medications, Figure 2.1.**4**).

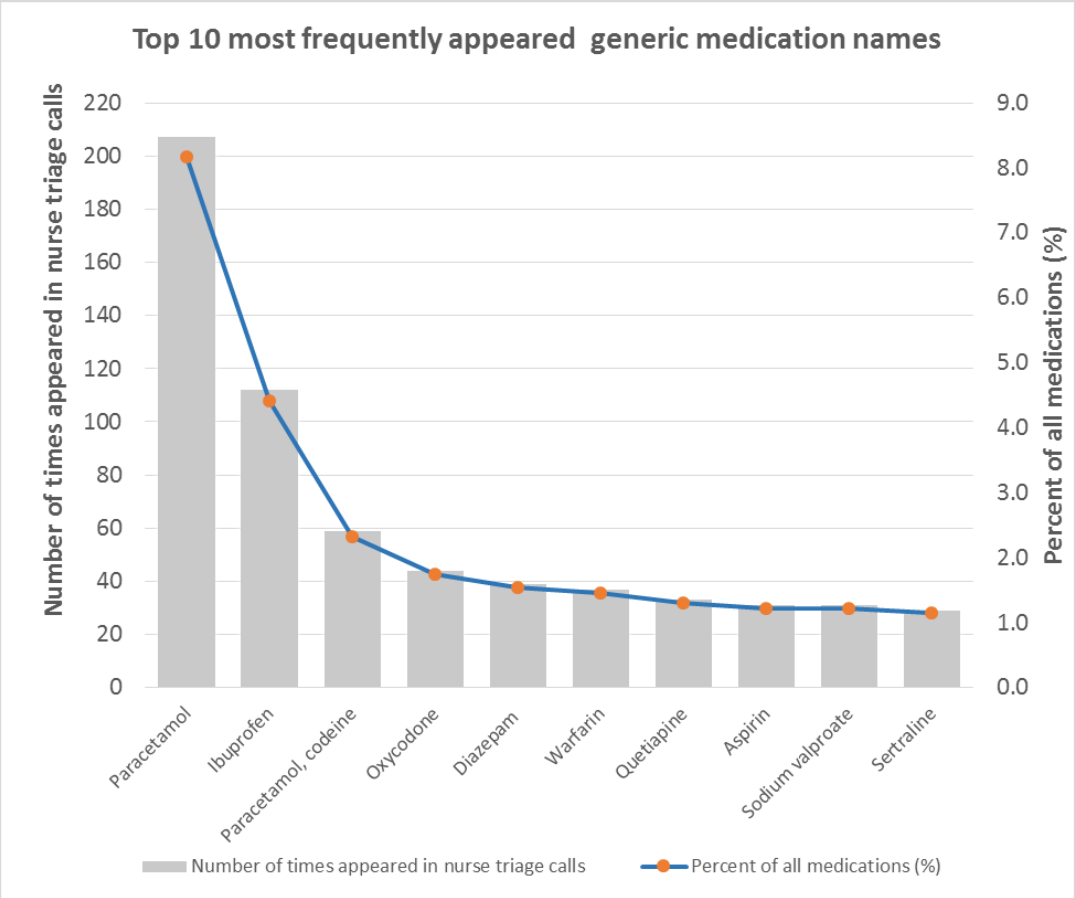


Figure 2.1.4 Top ten most frequent generic medication names

By MIMS categories

We were able to classify 2299 (90.7%) medications into 118 MIMS categories. The most frequently appearing categories were simple analgesics and antipyretics (n=230 times for 9.1% of all medications involved in the nurse triage medication calls),

followed by nonsteroidal anti-inflammatory agents (n=170, for 6.7% of medications), and antidepressants (n=157, for 6.2% of medications).

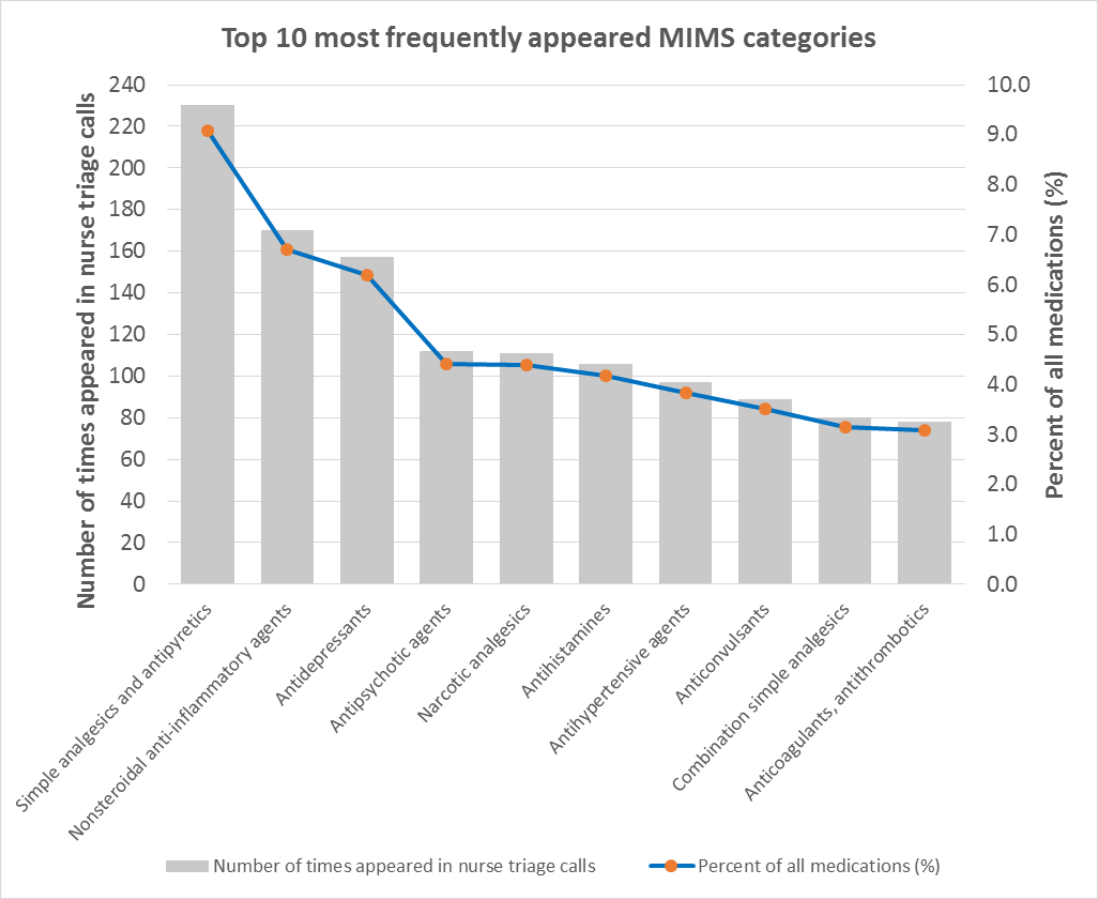


Figure 2.1.2. Top ten most frequently appearing MIMS categories

Number of medications

Of 1835 medication-related calls, 206 (11.23%) had no medication information included in the presenting problem. The remaining calls (88.77%) had up to 12 medications mentioned in a call (Table 2.1.**17**). More than half of calls (55.31%) involved only one medication. For further analysis, we combined calls with small numbers of medications.

Table 2.1.17 Number of medications per call

Number of medications	Number of calls	Percent

0	206	11.23
1	1015	55.31
2	456	24.85
3	95	5.18
4	36	1.96
5	15	0.82
6	6	0.33
7	2	0.11
8	2	0.11
12	2	0.11
Total	1835	100.01

Number of medications and patient characteristics

By gender

There was no association between patient gender and the number of medications involved in medication calls (p=0.06 with DF=4 and χ^2=8.9; Table 2.1.**18**).

Table 2.1.18 Number of medications and patient gender

Patient gender	**Number of mediations (row percent)**					**Total**
	0	1	2	3	4-12	
Female	122(10.31)	660(55.79)	310(26.2)	57(4.82)	34(2.87)	1183
Male	84(12.88)	355(54.45)	146(22.39)	38(5.83)	29(4.45)	652

By age group

Calls for older patients were more likely to involve a greater number of medications (3 or more) than calls for patients that were ≤14 years old (p=0.02 with DF=6 and χ^2=15.5; Table 2.1.**19**).

Table 2.1.19 Number of medications and patient age

Patient age	**Number of mediations (row percent)**				**Total**
	0	1	2	3-12	
14 years or under	30(10.49)	164(57.34)	81(28.32)	11(3.85)	286
15-65 years	137(11.13)	664(53.94)	312(25.35)	118(9.59)	1231
>65 years	39(12.26)	187(58.81)	63(19.81)	29(9.12)	318

Number of medications and call characteristics

Time of calls

There was a strong association between time of call and the number of medications involved (p=<0.001 with DF=6 and χ^2=31.3; Table 2.1.**20**). Calls were more likely to involve 2 or more medications if they were made between 22:00 and 8:00 than calls made during other times of the day.

Table 2.1.20 Number of medications and time of call

Time	**Number of mediations (row percent)**				**Total**
	0	**1**	**2**	**3-12**	
22:00-8:00	46(11.11)	193(46.62)	139(33.57)	36(8.7)	414
8:00-17:00	93(11.58)	480(59.78)	157(19.55)	73(9.09)	803

17:00-22:00	67(10.84)	342(55.34)	160(25.89)	49(7.93)	618

Patient final dispositions

There was no association between number of medications involved in the call and patient final disposition (p=0.06 with DF=9 and χ^2=16.6).

Table 2.1.21 Number of medications and final disposition

Number of medications	Call Poisons Information Centre Immediately	Provide Home/Self Care	See Doctor within 24 Hours.	See appropriate Health Provider within 24 hours	Total
0	7(3.4)	116(56.31)	22(10.68)	61(29.61)	206
1	49(4.83)	526(51.82)	93(9.16)	347(34.19)	1015
2	9(1.97)	273(59.87)	34(7.46)	140(30.7)	456
3-12	8(5.06)	90(56.96)	9(5.7)	51(32.28)	158

Duration of calls

Call length was not associated with the number of medications involved in a call. As shown in Figure 2.1.**5**, the average duration of calls was similar, i.e. 9-10 minutes (diamond in the figure) regardless of the number of medications, and 50% of calls had a duration of 9 minutes (lines in the middle of the boxes).

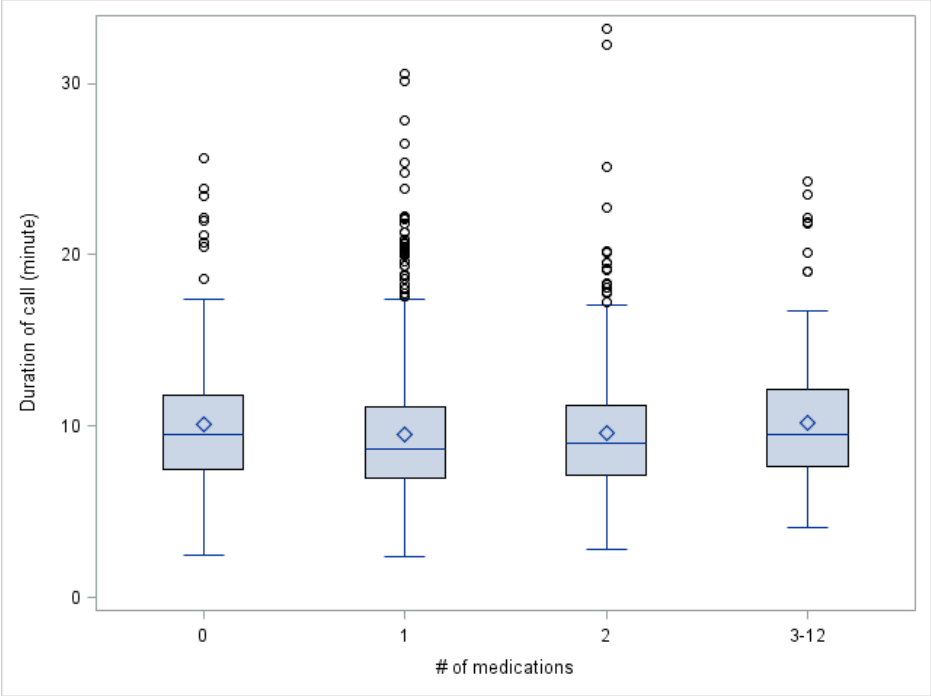


Figure 2.1.5 Number of medications and duration of calls

Other information extracted from presenting problems

- 29 calls involved alcohol/illicit drug use (20 on alcohol and 9 on drugs including “ice”, “pot”, heroin, MDMA, marijuana).
- Nurses recommended medications to 25 callers. These medications included Panadol (or mersyndol; 10 calls), Nurofen (analgesia or painstop; 7 calls) and other medications (Coversyol, Gastrolyte, OTC antacid, OTC pain relief, older antihistamines [eg. Polarimine, nasal sprays fess or rhinocort], Ondansetron, Paracetamol, Worms treatment; 1 each).

Patient questions

The majority of calls (77.77%) related to two main questions: “Requesting uncomplicated medication information” and “No Medication Resource Available OR Information required is outside scope of Triage Nurse” (Table 2.1.**22**).

Table 2.1.22 Top 5 most common patient questions

PATIENT QUESTION	Frequency	Percent
Requesting uncomplicated medication information	770	41.96
No Medication Resource Available OR Information required is outside scope of Triage Nurse	602	32.81
Has missed a single dose of medication	139	7.57
Has taken an accidental extra dose of usual medication AND is asymptomatic	68	3.71
Patient does NOT consent to transfer to Telephone GP or GPAT or call is outside GP After Hours Service operating hours and is therefore INELIGIBLE for transfer	64	3.49
Total	1835	99.98

Data consistency

We examined if the patient questions selected by nurses were consistent with the free text information recorded in the patient presenting problem field. We found that these were consistent in 63.27% of calls (n=1161) and inconsistent in 35.69% of calls (n=655 calls). There was not enough information to make this assessment in 19 calls (1.03%).

Of the 655 inconsistent cases, 596 (91.0%) were selected by nurses as "No Medication Resource Available OR Information required is outside scope of Triage Nurse". We re-grouped these inconsistent cases based on the information contained in the patient presenting problem field, as shown in Table 2.1.8. The majority of these cases (72.67%) could be classified as "Requesting info" (Table 2.1.**23**).

Table 2.1.23 Re-grouping of inconsistent patient questions

	Regrouped patient question

PATIENT QUESTION	Requesting info	Concern after taking medication	Missed dose of medication	Wants to access medication	Any dosing issue	Accidental ingestion/ OD	Patient has vomited medication	Total
No Medication Resource Available OR Information required is outside scope of Triage Nurse	443	75	25	24	25	3	1	596
Patient does NOT consent to transfer to Telephone GP or GPAT or call is outside GP After Hours Service operating hours and is therefore INELIGIBLE for transfer	19	6	8	3	2	0	0	38
Caller is from an ineligible contract, (from Tasmania during business hours or declines transfer), is anonymous or an unaccompanied minor and is therefore INELIGIBLE for transfer	5	1	3	1	0	0	0	10
Caller is in Tasmania AND GP Assist Tasmania service is available AND caller consents to transfer to GPAT (complete provider referral process and consent in custom field prior to closing encounter and transferring call)	3	0	0	2	1	0	0	6
After Hours GP Helpline is available AND caller consents to transfer to telephone GP (complete encounter THEN transfer caller to GP)	1	0	1	0	1	0	0	3
Requesting uncomplicated medication information	2	0	0	0	0	0	0	2
Total	473	82	37	30	29	3	1	655

Caller questions and time of day

We found little variation in the top five most common patient questions asked at different times of day. 'No Medication Resource Available OR Information required is outside scope of Triage Nurse' and 'Requesting uncomplicated medication information' were consistently the most frequently asked questions, although their order varied slightly. 'Has missed a single dose of medication' was always the third most frequent patient question (Table 2.1.**24**).

Table 2.1.24 Top five most common patient questions by time of day

Time Period	Question	Frequency	Percentage of daytime calls
Daytime **8:00 – 17:00** **(Total 805/ 1835)**	No Medication Resource Available OR Information required is outside scope of Triage Nurse	365	45.34%
	Requesting uncomplicated medication information	258	32.04%
	Has missed a single dose of medication	56	6.9%
	Patient does NOT consent to transfer to Telephone GP or GPAT or call is outside GP After Hours Service operating hours and is therefore INELIGIBLE for transfer	38	4.7%
	Has run out of usual prescribed medication AND next dose is required before usual prescriber is available.	24	2.98%

Evening **5pm-10pm** **(Total 615/ 1835)**	Requesting uncomplicated medication information	302	49.10%
	No Medication Resource Available OR Information required is outside scope of Triage Nurse	146	23.73%
	Has missed a single dose of medication	55	8.94%
	Has taken an accidental extra dose of usual medication AND is asymptomatic	27	4.39%
	Patient does NOT consent to transfer to Telephone GP or GPAT or call is outside GP After Hours Service operating hours and is therefore INELIGIBLE for transfer	22	3.57%
Night **10pm – 8am** **(Total 415/ 1835)**	Requesting uncomplicated medication information	210	50.60%
	No Medication Resource Available OR Information required is outside scope of Triage Nurse	91	21.92%
	Has missed a single dose of medication	28	6.74%
	Has taken an accidental extra dose of usual medication AND is asymptomatic	24	5.78%

	Has run out of usual prescribed medication AND next dose is required before usual prescriber is available.	15	3.61%

Repeat Callers

Fifty-five repeat callers were identified in the November medication calls data, accounting for 118/1835 (6.43%) of calls. The vast majority of these callers, 49/55 (89.09%) called twice, 5/55 (9.09%) called three times and one caller, 1.81%, called five times. 42/55 (76.36%) of the repeat callers were female, and 13/55 (23.63%) were male. 25.45% of repeat callers were aged between 51-60 years, while the next largest age group was 31-40 years, with 18.18% of repeat callers in this group. The medications commonly enquired about during these calls were: none (10/148), antibiotics [penicillins] (10/148) and Seroquel [an anti-psychotic medication] (7/148).

When we examined the subject and queries made by repeat callers, we found that 38.18% (21/55) of callers asked the same question about the same medication and 38.18% (21/55) of callers asked different questions about different medications. 14.54% (8/55) asked the same question about different medications and 5.45% (3/55) callers asked different questions about the same medication.

Technical Difficulties

Our analysis of the free text column identified only seven calls where a technical difficulty was mentioned, or 0.381% (7/1835) of calls. In all these cases, the free text contained information about MIMS online being ‘down’ or inaccessible.

SUMMARY

Our analyses of medication calls made in November 2014 revealed that the most common medications called about were paracetamol, ibuprofen and paracetamol and codeine. The three most frequent MIMS categories were ‘simple analgesics and antipyretics,’ ‘non-steroidal anti-inflammatory agents’ and ‘antidepressants.’ Over

half of the medication calls related to a single medication, and 11.23% of calls did not include a name of a medication.

Female callers and callers aged between 15 and 65 years mentioned more medications during calls than male callers, or callers in other age brackets. Calls made at night, between 22:00 and 8:00, were more likely to relate to two or more medications, than calls made at other times of the day. No association was found between the number of medications mentioned in calls and the final disposition of the call or the call duration.

The three most frequent caller question categories were 'requesting uncomplicated medication information,' (41.96%), 'no medication resource available OR information required is outside the scope of triage nurse,' (32.80%) and 'has missed a single dose of medication' (7.57%). These categories remained the top three, regardless of the time of day the call was made.

There were fifty-five repeat callers, accounting for 6.43% of calls. The majority of repeat callers were females (76.36%) aged between 51-60 years (25.45%). During repeat calls, these callers tended to ask the same questions about the same medications, or different questions about different medications (38.18% each). The medications commonly enquired about during these calls were: none (10/148), antibiotics (10/148) and Seroquel (7/148).

Technical difficulties accessing the eMIMS database were encountered during 7/1835 calls, or 0.381% of calls.

Potential errors or problems with data

Potential errors in 2014 data

1) The adult medication guideline was recorded as being used for a call for a patient aged <1 years.
2) The paediatric guideline was recorded as being used for 29 calls for patients aged 15 years and over.
3) There were 10 calls made by 10 callers aged under 6 years.

We suspect that these problems could be the result of 1) a nurse accidently choosing the wrong guidelines and/or 2) data entry errors for patient and caller ages. These

records were used in our analyses given that other information about these calls may have been accurate.

Data problems encountered in November data

A key barrier to the in-depth analysis of medication-related call data was the free text 'patient presenting problem' column. This text formed the basis of many of our analyses. The text in this column (most likely a consequence of the time pressure under which calls are taken) contained many errors, both spelling and grammatical.

Study 2.2 Analysis of after hours GP helpline medication calls

INTRODUCTION

This study component focused on analysing the data collected from calls transferred to the after hours GP helpline. The after hours GP helpline is available between 18:00 – 8:00 on weekdays, Saturday 12:00 – Monday 8:00, and 24 hours a day on public holidays.

METHOD

A detailed descriptive analysis was performed on 12 months of data (2014) by examining volume of calls over time, by state, the type of decision support tool used, by patient outcomes and by the final disposition.

We further analysed the GP data set for November 2014 to identify the most common types of calls transferred to this service. GPs documented the problem presented under the free-text variable "*GP_Presenting Problem*". The description in this variable was used to assign the query to one of the categories defined in Table 2.2.1. These categories were developed based on an initial review of the data by research team members. Based on this categorisation, data were then analysed to identify the distribution of queries by age groups and the GP outcome. The data were also analysed to identify the decision support tools most frequently used by GPs.

Table 2.2.1 Query types for classifying GP data (November 2014)

Query Type	Description
Medication enquiry - Not classified	No description included or limited detail available. Listed as Medication Enquiry, Medication Question or NA
Side effects	Description indicates that caller is enquiring about side effects of a particular medication
Interactions	Description indicates that caller is enquiring about possible interactions between one medication and another
How to take	Description indicates that caller wants to know how to take a

	particular medication (dose, time etc.)
Overdosing	Description indicates that patient has taken an overdose of a medication
Treatment of a condition	Description indicates that caller is seeking medication-related advice related to a condition(s) or symptoms (e.g. fever) of a condition
Medication in pregnancy	Description indicates that caller is enquiring about use of medications during pregnancy
Medication while breast feeding	Description indicates that caller is enquiring about use of medications while breast feeding
Missed medications	Description indicates that caller is enquiring about missed medications or a missed dose of a medication
Wrong medication	Description indicates that caller is enquiring about taking a wrong medication

RESULTS

Volume of medication calls

Medication calls over time

In 2014, there were 208,837 calls recorded in the after hours GP helpline database. The largest number of calls were made in August, followed by March, April and January. Among these calls, 13,600 calls (6.51%) were medication-related calls (Figure 2.2.1). The percentage of calls that were medication-related varied each month from 5.08% to 8.06%. February, March and January had the highest proportion of medication calls.

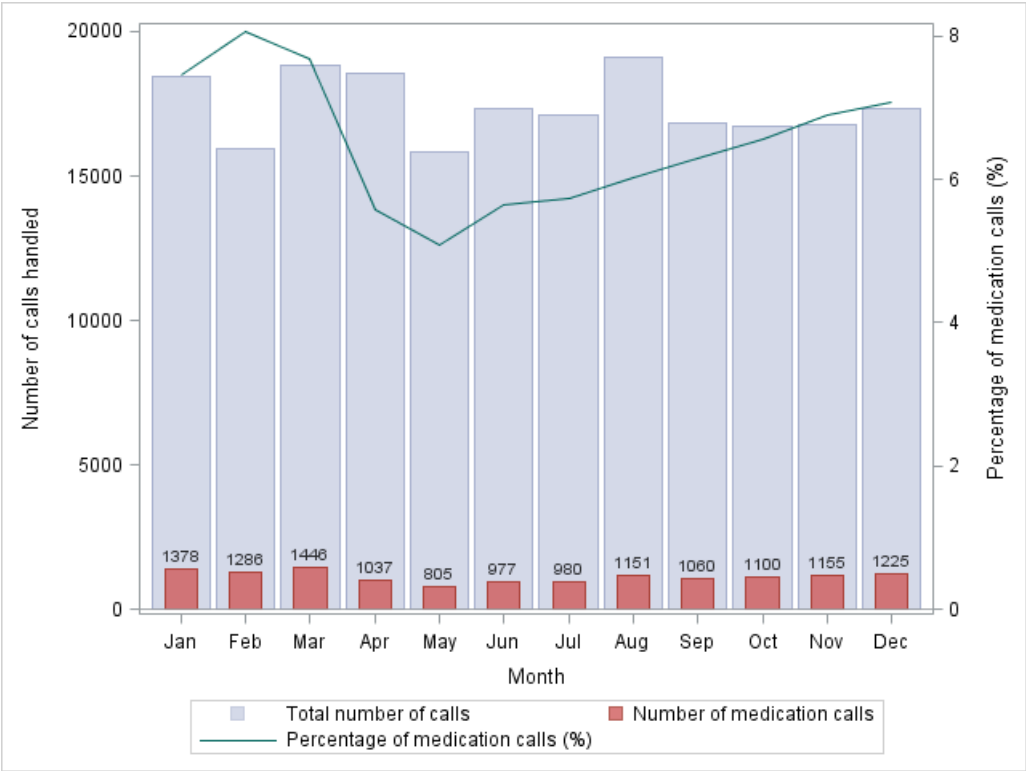


Figure 2.2.1 Medication calls over time (2014)

Table 2.2.2 Volume of medication calls

Month	Number of medication calls	Percentage of medication calls (%)	Total number of calls
Jan	1,378	7.47	18,453
Feb	1,286	8.06	15,953
Mar	1,446	7.68	18,832
Apr	1,037	5.58	18,581
May	805	5.08	15,846
Jun	977	5.64	17,330
Jul	980	5.73	17,093
Aug	1,151	6.03	19,092

Sep	1,060	6.29	16,850
Oct	1,100	6.57	16,738
Nov	1,155	6.89	16,759
Dec	1,225	7.08	17,310
Total	13,600	6.51	208,837

Paediatric and adult medication calls over time

Of all medication calls, 16.96% related to paediatric medications and 83.04% related to adult medications (Figure 2.2.2). August and September had the highest percentage of paediatric medication calls.

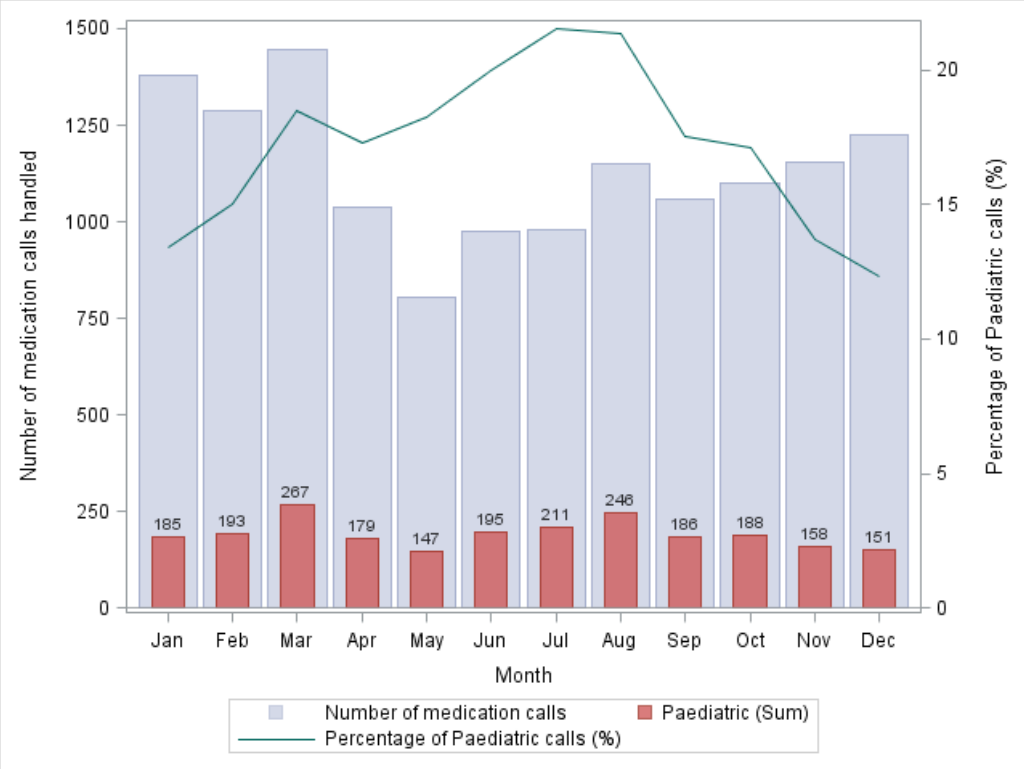


Figure 2.2.2 Volume of medication calls - paediatric and adult calls

Table 2.2.3 Medication call distribution - adults and paediatrics

Month	Number of paediatric medication calls	Percentage of paediatric calls (%)	Number of adult medication calls	Percentage of adult calls (%)	Number of medication calls
Jan	185	13.43	1193	86.57	1378
Feb	193	15.01	1093	84.99	1286
Mar	267	18.46	1179	81.54	1446
Apr	179	17.26	858	82.74	1037
May	147	18.26	658	81.74	805
Jun	195	19.96	782	80.04	977
Jul	211	21.53	769	78.47	980
Aug	246	21.37	905	78.63	1151
Sep	186	17.55	874	82.45	1060
Oct	188	17.09	912	82.91	1100
Nov	158	13.68	997	86.32	1155
Dec	151	12.33	1074	87.67	1225
Total	2306	16.96	11,294	83.04	13,600

Medication calls by state and over time

In 2014, 96.44% of medication calls were made from NSW, VIC, WA and SA. Across the 12 months, the distribution of calls for these four states was very similar (Table 2.2.3). For all states in 2014, March had the greatest proportion of medication-related calls in the year (10.63%) and May had the smallest proportion (5.92%) (Figure 2.2.4).

Table 2.2.3 Medication calls volume by state

State	Number of calls	%
NSW	5,620	41.32
VIC	4,105	30.18
WA	1,769	13.01
SA	1,622	11.93
ACT	343	2.52
NT	106	0.78
Unknown	24	0.18
QLD	10	0.07
TAS	1	0.01
Total	13,600	100.01

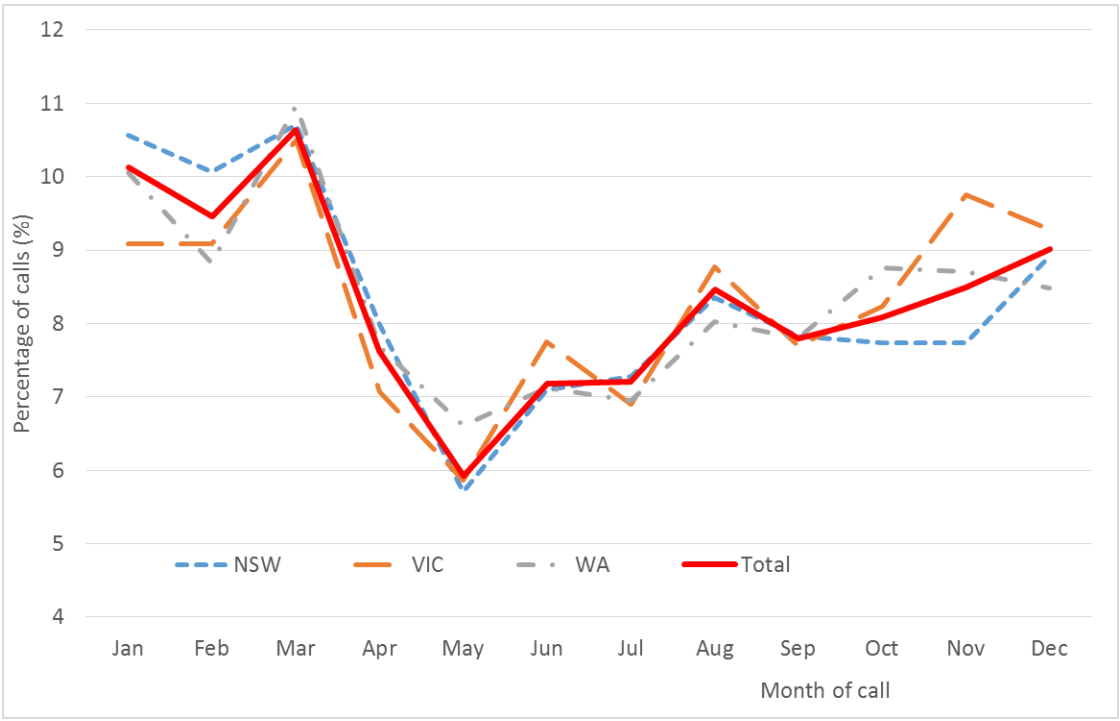


Figure 2.2.4 Medication call trends by state

Call transfer and call back

Call transfer time

Call transfer time is defined as the time from the end of the nurse triage session to the start of the GP session. There were 6566 calls where the GP call session started one second before the nurse session ended. The transfer time of these calls was treated as zero in our analysis. Of 13,407 calls with a valid transfer time (i.e. non-negative), only 10 calls had a transfer time longer than 1 second (range from 22 seconds to 14 minutes).

Call back

No call was scheduled for a call back service.

Primary decision support tools used

Overall

GPs did not use a decision support tool in 74.04% of calls and used MIMS Online for 21.52% of calls (Table 2.2.4).

Table 2.2.4 Use of decision support tools

Primary decision support tool	Number of calls	Percent
None/NA/other	10,069	74.04
MIMS Online	2,927	21.52
Murgtagh's General Practice	209	1.54
PROMPT Guidelines	164	1.21
eTG Complete	113	0.83
RCH Paediatric Guideline	93	0.68
The Royal Women's Hospital	19	0.14
Harrison's Online	6	0.04
Total	13,600	100.00

MIMS Online

The proportion of calls where MIMS Online was used as a decision support tool increased from 18.58% in January to 28.65% in December (Figure 2.2.5).

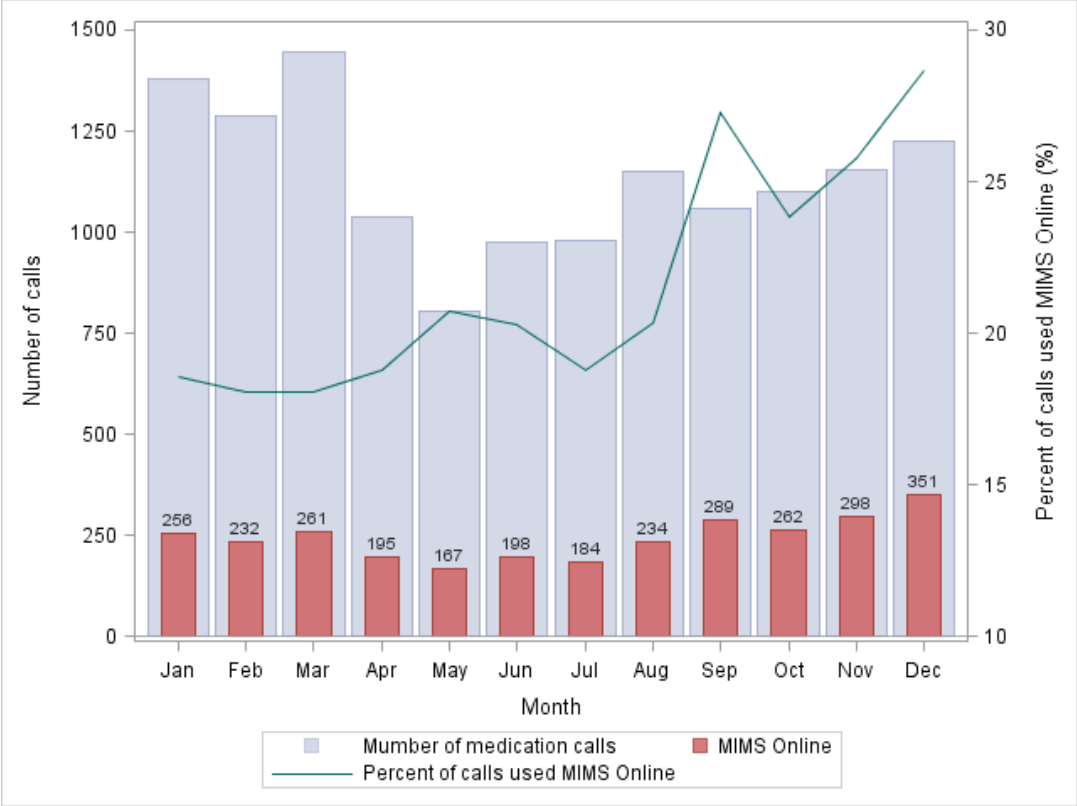


Figure 2.2.5 Use of MIMS Onlilne

Table 2.2.5 Use of MIMS Online

Month	MIMS Online	Percent of MIMS used (%)	Total
Jan	256	18.58	1378
Feb	232	18.04	1286
Mar	261	18.05	1446
Apr	195	18.80	1037
May	167	20.75	805
Jun	198	20.27	977
Jul	184	18.78	980
Aug	234	20.33	1151

Sep	289	27.26	1060
Oct	262	23.82	1100
Nov	298	25.80	1155
Dec	351	28.65	1225
Total	2927	21.52	13600

Patient intentions and dispositions

Caller original intentions

For nearly one third of calls (30.74%), callers planned to administer home/self care prior to calling Healthdirect. For 28.62% of calls, callers reported that they did not know what to do (Table 2.2.6).

Table 2.2.6 Medication call distribution by caller intentions

Original intention	Number of calls	Percent
000 Ambulance	152	1.12
Attend Emergency Department	1290	9.49
Contact Doctor//Healthcare Provider	2539	18.67
Did not know what to do	3892	28.62
Home/Self Care	4180	30.74
No GP or GP Appt Available	49	0.36
Non-Professional Advice	227	1.67
Other Healthcare Provider (Non GP)	287	2.11
See GP After Hours	206	1.51

See GP Business Hours	174	1.28
Unknown	604	4.44
Total	13600	100.01

Patient final dispositions

For the majority of calls (85.56%), GPs gave the advice of 'Self Care Advice + See GP in Hours' (50.91%), 'Self Care Advice + See Health Care Provider' (4.07%) and 'Self Care Advice Only' (30.57%) (Table 2.2.7).

Table 2.2.7. Medication call distribution by final dispositions

GP outcome group	Number of calls	%	GP outcome	Number of calls	Percent
ED	307	2.26	Activate 000	33	0.24
			ED Immediately	265	1.95
			ED Immediately [No transport – Activate 000]	9	0.07
GP	1025	7.54	GP Immediately	585	4.3
			GP Immediately [No GP Available - Go to ED]	401	2.95
			GP Out of Hours - Not Urgent	16	0.12
			GP Out of Hours - Urgent	23	0.17
Mental Health Referral [AH]	18	0.13	Mental Health Referral [AH]	18	0.13
Self Care advice (+other)	11636	85.56	Self Care Advice + See GP in Hours	6924	50.91

			Self Care Advice + See Health Care Provider	554	4.07
			Self Care Advice Only	4158	30.57
NA/Unknown	614	4.51	NA	433	3.18
			(Missing)	181	1.33
Total	13600	100		13600	99.99

Original intentions and final dispositions (highlighted rows are row percentages)

Of 1442 calls where the caller had originally intended to call 000 or attend an ED prior to calling Healthdirect, 76.7% were advised by the telephone provider to self-care and only 5.48% were advised to call 000 or go to an ED. On the other hand, of 4180 calls with the original intention of home/self care, 86 cases (2.06%) were advised to call 000 or attend an ED.

Table 2.2.8. Distribution by original intention and final disposition

Original intention group	**GP outcome group**					
	Self Care advice (+other)	GP	NA/Unknown	Active 000/ED	Mental Health Referral [AH]	Total
Home/Self Care	3649	258	181	86	6	4180
	87.3	6.17	4.33	2.06	0.14	
Did not know what to do	3374	271	170	74	3	3892
	86.69	6.96	4.37	1.9	0.08	
Contact Doctor//Healthcare Provider	2203	196	105	34	1	2539
	86.77	7.72	4.14	1.34	0.04	
000 Ambulance/ED	1106	178	78	79	1	1442
	76.7	12.34	5.41	5.48	0.07	

Unknown	491	55	39	18	1	604
	81.29	9.11	6.46	2.98	0.17	
GP	316	37	18	7	2	380
	83.16	9.74	4.74	1.84	0.53	
Other Healthcare Provider (Non GP)	259	15	8	4	1	287
	90.24	5.23	2.79	1.39	0.35	
Non-Professional Advice	201	8	11	5	2	227
	88.55	3.52	4.85	2.2	0.88	
No GP or GP Appt Available	37	7	4	0	1	49
	75.51	14.29	8.16	0	2.04	
Total	11636	1025	614	307	18	13600

Extended analysis GP data – November 2014

Of 1155 medication calls transferred to the after hours GP helpline in November 2014, 24 cases were excluded from the extended analysis due to missing information (no problem description). Of the remaining 1131 medication calls transferred to the GP after hours helpline, 36.9% of the queries contained very little information (except for being identified as a medication query), restricting the possibility of further classifying these calls by type (Figure 2.2.6). 39.08% of the queries were related to the treatment of a specific condition. 10.34% of queries were from patients asking how to take medications, which included queries on route and dose of a medication. The small amount of free text information included in this field limited our capacity to clearly identify query types. In most cases, medication names were not included in the description.

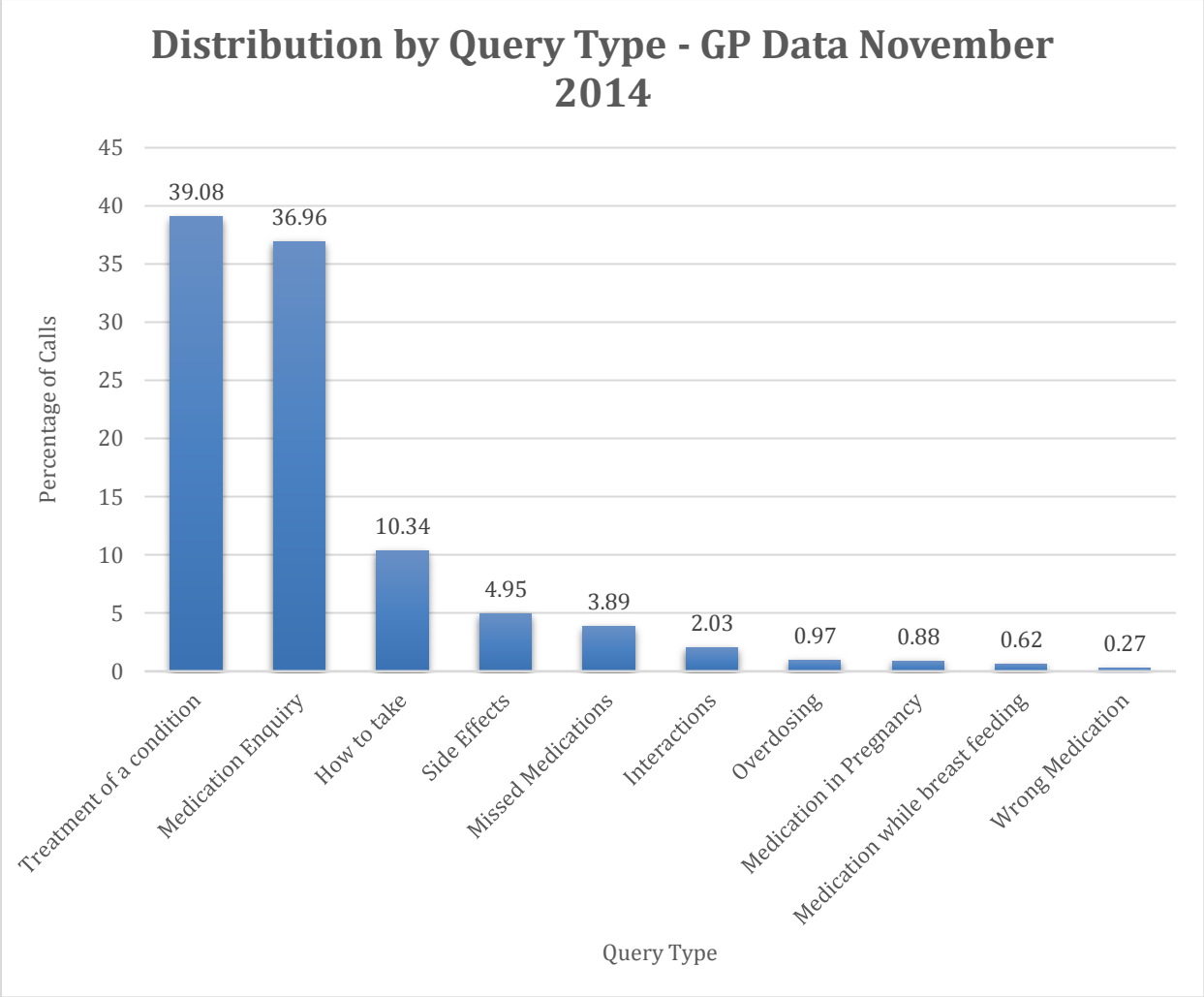


Figure 2.2.6 Distribution by query types (Nov 2014)

Distribution of query types by age groups (November 2014)

For all age groups 'treatment of a condition' and 'medication enquiry' were the most frequent type of queries. For age group <1 year, 'treatment of a condition' (n=17) and 'medication enquiry' (no description available) (n=9) were the most common query types. Other query types for age group <1 year included 'side effects', 'how to take' and 'medication while breast feeding'. For adults aged 15-25 years and 26-45 years, in addition to the top two query types, there were queries that related to the use of medications in pregnancy and medication use while breast feeding. The variance in types of queries was higher in the older age groups 46-65 years and >65 years. In addition to the top two categories (treatment of a condition and medication enquiry),

there were queries related to how to take medications (n= 25, n=21), missed medications (n= 11, n=15), side effects (n=10, n=9) and interactions (n=6, n=2).

Table 2.2.9 Distribution of query types by age group

Patient Age Group	Query Type	Number of Calls	Percentage
>1 year	Treatment of a condition	17	51.52
	Medication Enquiry	9	27.27
	Side Effects	3	9.09
	How to take	3	9.09
	Medication while breast feeding	1	3.03
		33	
1-4 years	Treatment of a condition	18	40.91
	Medication Enquiry	15	34.09
	How to take	7	15.91
	Side Effects	4	9.09
		44	
5-9 years	Treatment of a condition	28	51.85
	Medication Enquiry	13	24.07
	How to take	9	16.67
	Overdosing	2	3.7
	Side Effects	1	1.85
	Missed Medications	1	1.85
		54	
10-14 years	Treatment of a condition	10	43.48
	Medication Enquiry	9	39.13

	How to take	3	13.04
	Side Effects	1	4.35
		23	
15-25 years	Treatment of a condition	51	35.17
	Medication Enquiry	51	35.17
	How to take	20	13.79
	Missed Medications	7	4.83
	Side Effects	6	4.14
	Interactions	5	3.45
	Medication in Pregnancy	4	2.76
	Wrong Medication	1	0.69
		145	
26-45 years	Medication Enquiry	130	38.24
	Treatment of a condition	125	36.76
	How to take	29	8.53
	Side Effects	22	6.47
	Missed Medications	10	2.94
	Interactions	10	2.94
	Medication in Pregnancy	6	1.76
	Medication while breast feeding	6	1.76
	Wrong Medication	1	0.29
	Overdosing	1	0.29
		340	
46-65 years	Medication Enquiry	101	39.61

	Treatment of a condition	99	38.82
	How to take	25	9.8
	Missed Medications	11	4.31
	Side Effects	10	3.92
	Interactions	6	2.35
	Overdosing	2	0.78
	Wrong Medication	1	0.39
		255	
>65 years	Treatment of a condition	94	39.66
	Medication Enquiry	90	37.97
	How to take	21	8.86
	Missed Medications	15	6.33
	Side Effects	9	3.8
	Overdosing	6	2.53
	Interactions	2	0.84
		237	
Grand Total		**1131**	

Distribution by time (November 2014)

For medication-related calls referred to the after hours GP helpline in November 2014, the busiest hours were 22:00 – 8:00 with 46.68% of the calls received during this period (Figure 2.2.7).

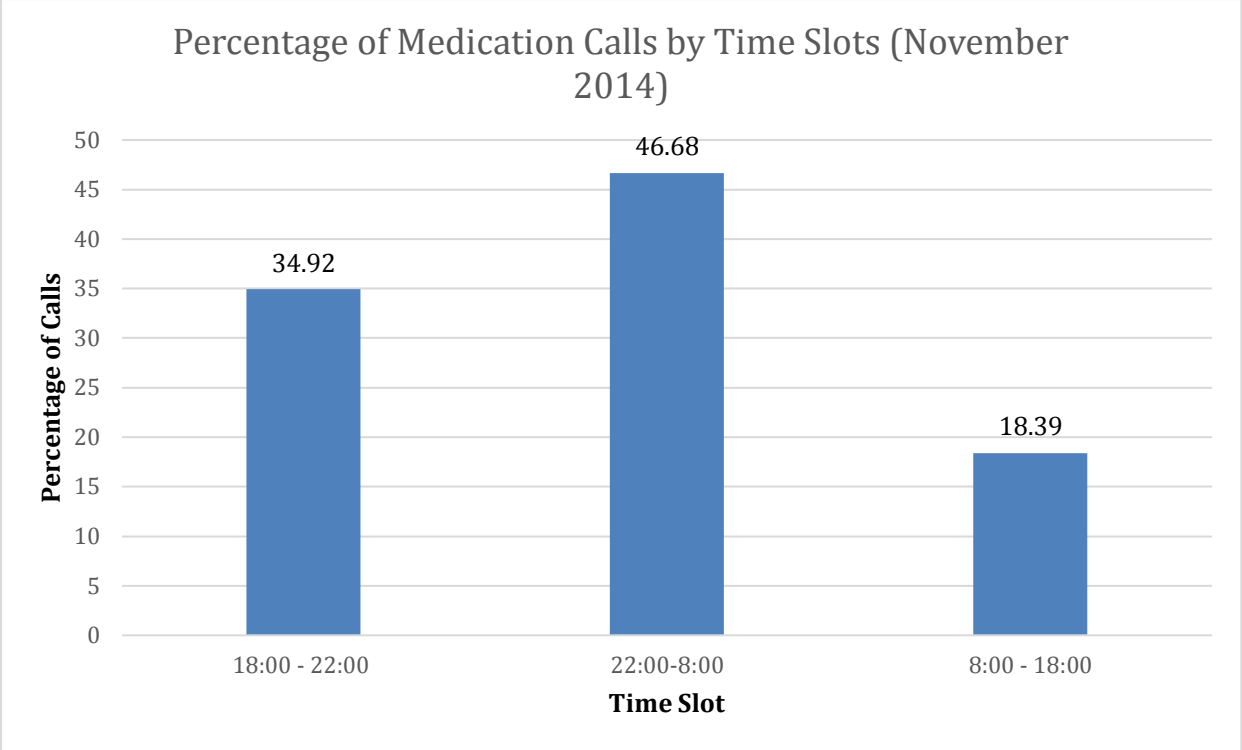


Figure 2.2.7 Distribution by time of call (November 2014)

As depicted in the table below, 18:00 – 22:00 was a busy time slot for all type of queries received by the after hours GP helpline. The common types of queries received during this time slot included medication enquiry (not otherwise specified) (n =204), treatment of a condition (n=189), how to take (n=59), side effects (n=22), missed medications (n=22) and interactions (n=11). Treatment of a condition (n=181), medication enquiry (n=131), how to take (n=33) and missed medications (n=16) were the common types of queries received between 22:00 – 8:00. Six of the total eleven overdosing queries were also received during this time slot (Table 2.2.10).

Table 2.2.10 Distribution by query types and time of call

Query Type	Time Slot	Number of Calls (%)
Treatment of a condition	22:00 - 8:00	181(41%)
	18:00 -22:00	189(42.7)

	8:00 - 18:00	72(16.2%)
		442
Medication Enquiry	22:00 - 8:00	131(31.3%)
	18:00 -22:00	204(48.8%)
	8:00 - 18:00	83(19.8%)
		418
How to take	22:00 - 8:00	33(28.2%)
	18:00 -22:00	59(50.4%)
	8:00 - 18:00	25(21.36)
		117
Side Effects	22:00 - 8:00	15 (26.8%)
	18:00 -22:00	34(60.7%)
	8:00 - 18:00	7(12.5%)
		56
Missed Medications	22:00 - 8:00	16(36.4%)
	18:00 -22:00	22(50%)
	8:00 - 18:00	6 (13.6%)
		44
Interactions	22:00 - 8:00	7(30.4%)
	18:00 -22:00	11(47.8%)
	8:00 - 18:00	5(21.7%)
		23
Overdosing	22:00 - 8:00	6(54.5%)
	18:00 -22:00	3(27.2%)

	8:00 - 18:00	2(18.1%)
		11
Medication in Pregnancy	22:00 - 8:00	3 (30%)
	18:00 -22:00	3 (30%)
	8:00 - 18:00	4(40%)
		10
Medication while breast feeding	22:00 - 8:00	2(28.5%)
	18:00 -22:00	1(14.2%)
	8:00 - 18:00	4(57.1%)
		7
Wrong Medication	22:00 - 8:00	1(33%)
	18:00 -22:00	2(66%)
		3
Grand Total		**1131**

Distribution by GP outcome (November 2014)

For November 2014, we analysed how GP outcomes varied for different types of queries. Overall for all types of queries, *Self Care Advice +Other* was the most frequent outcome group. For the query types 'treatment of a condition', 'medication enquiry', 'how to take' and 'side effects', *Self Care Advice + see GP in Hours* (n=246, n=194, n=60, n=34) was the most common GP outcome. For 'treatment of condition' queries, 26 calls had *ED Immediately* as the GP outcome (Table 2.2.11). In category 'medication enquiry' 18 calls had *Not Applicable* as an outcome, which may indicate that these calls were disconnected before an outcome was finalised by the GP. For the query type 'missed medications', *Self Care Advice* (n=23) was the most frequent GP outcome, followed by *Self Care Advice + See GP in Hours* (n=19). For three of the 'interaction calls' the outcome was *See GP Immediately*. A single caller with a

medication in pregnancy query was advised to see a GP and another was advised to visit an ED. *Self Care Advice* was the most common outcome for 'medication in breast feeding' queries.

Table 2.2.11 Distribution by GP outcome

Query Type	GP Outcome Group	Number of Calls	%	GP Outcome	Number of Calls	%
Treatment of a condition	Self Care Advice +Other	357	80.77	Self Care Advice + See GP in Hours	246	55.66
				Self Care Advice + See Health Care Provider	22	4.98
				Self Care Advice Only	89	20.14
				Activate 000	3	0.68
	ED	26	5.88	ED Immediately	24	5.43
				ED Immediately [No transport – Activate 000]	2	0.45
	GP	44	9.95	GP Immediately	31	7.01
				GP Immediately [No GP Available - Go to ED]	13	2.94
	Mental Health Referral	2	0.45	Mental Health Referral [AH]	2	0.45
	Not	10	2.26	Not Applicable	10	2.26

	Applicable					
Total					**442**	
Medication Enquiry	Self Care Advice +Other	372	89	Self Care Advice + See GP in Hours	194	46.41
				Self Care Advice Only	159	38.04
				Self Care Advice + See Health Care Provider	19	4.55
	ED	7	1.67	ED Immediately	7	1.67
	GP	21	5.02	GP Immediately	11	2.63
				GP Immediately [No GP Available - Go to ED]	10	2.39
	Not Applicable	18	4.31	Not Applicable	18	4.31
Total					**418**	
How to take	Self Care Advice +Other	100	85.47	Self Care Advice + See GP in Hours	60	51.28
				Self Care Advice Only	34	29.06
				Self Care Advice + See Health Care Provider	6	5.13
	ED	7	5.97	ED Immediately	5	4.27
				Activate 000	1	0.85

				ED Immediately [No transport – Activate 000]	1	0.85
	GP	6	5.13	GP Immediately	4	3.42
				GP Immediately [No GP Available - Go to ED]	2	1.71
	Not Applicable	4	3.42	Not Applicable	4	3.42
Total					**117**	
Side Effects	Self Care Advice +Other	45	80.36	Self Care Advice + See GP in Hours	34	60.71
				Self Care Advice Only	8	14.29
				Self Care Advice + See Health Care Provider	3	5.36
	ED	2	3.57	ED Immediately	2	3.57
	GP	8	14.29	GP Immediately	4	7.14
				GP Immediately [No GP Available - Go to ED]	2	3.57
				GP Out of Hours - Not Urgent	1	1.79
				GP Out of Hours - Urgent	1	1.79
	Not	1	1.79	Not Applicable	1	1.79

	Applicable					
Total					**56**	
Missed Medications	Self Care Advice +Other	43	97.72	Self Care Advice Only	23	52.27
				Self Care Advice + See GP in Hours	19	43.18
				Self Care Advice + See Health Care Provider	1	2.27
	GP	1	2.27	GP Immediately	1	2.27
Total					**44**	
Interactions	Self Care Advice +Other	19	82.61	Self Care Advice + See GP in Hours	10	43.48
				Self Care Advice Only	8	34.78
				Self Care Advice + See Health Care Provider	1	4.35
	GP	4	17.39	GP Immediately	3	13.04
				GP Immediately [No GP Available - Go to ED]	1	4.35
Total					**23**	
Overdosing	Self Care Advice +Other	7	63.63	Self Care Advice + See GP in Hours	5	45.45

				Self Care Advice Only	2	18.18
	GP	2	18.18	GP Immediately [No GP Available - Go to ED]	2	18.18
	ED	1	9.09	ED Immediately	1	9.09
	Not Applicable	1	9.09	Not Applicable	1	9.09
Total					**11**	
Medication in Pregnancy	Self Care Advice +Other	8	80	Self Care Advice + See GP in Hours	5	50
				Self Care Advice Only	3	30
	ED	1	10	ED Immediately	1	10
	GP	1	10	GP Immediately	1	10
Total					**10**	
Medication while breast feeding	Self Care Advice +Other	7	100	Self Care Advice Only	4	57.14
				Self Care Advice + See GP in Hours	2	28.57
				Self Care Advice + See Health Care Provider	1	14.29
Total					**7**	
Wrong Medication	Self Care Advice	3	100	Self Care Advice + See GP in Hours	2	66.66

	+Other		
		Self Care Advice Only	1	33.33
Total			**3**	
Grand Total			**1131**	

Use of decision support tools (November 2014)

For 70.74% (n=817) of medication-related queries received in November 2014, GPs did not use a decision support tool. Amongst the available decision support tools, MIMS online was the most accessed tool by GPs for all types of queries (25.8%, n=298). There was very little use of other decision support tools (Figure 2.2.8).

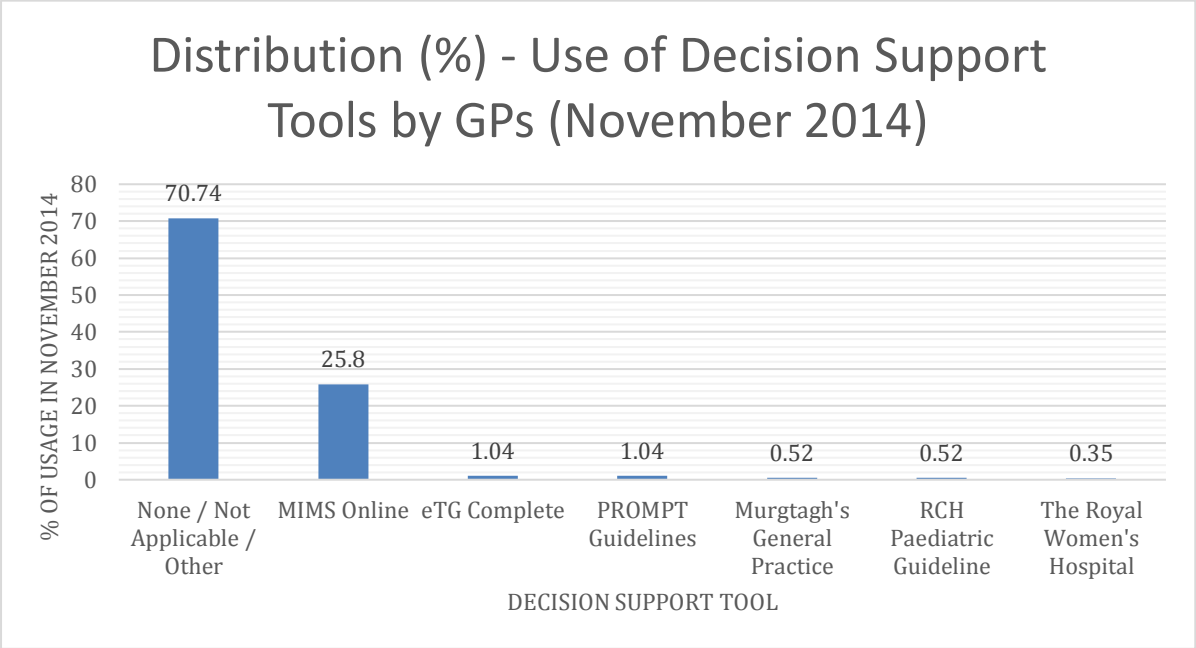


Figure 2.2.8 Use of decision support tools

MIMS online was used to answer ‘medication enquiries’, ‘treatment of a condition’ and ‘how to take’ queries, as depicted by the chart below (Figure 2.2.9).

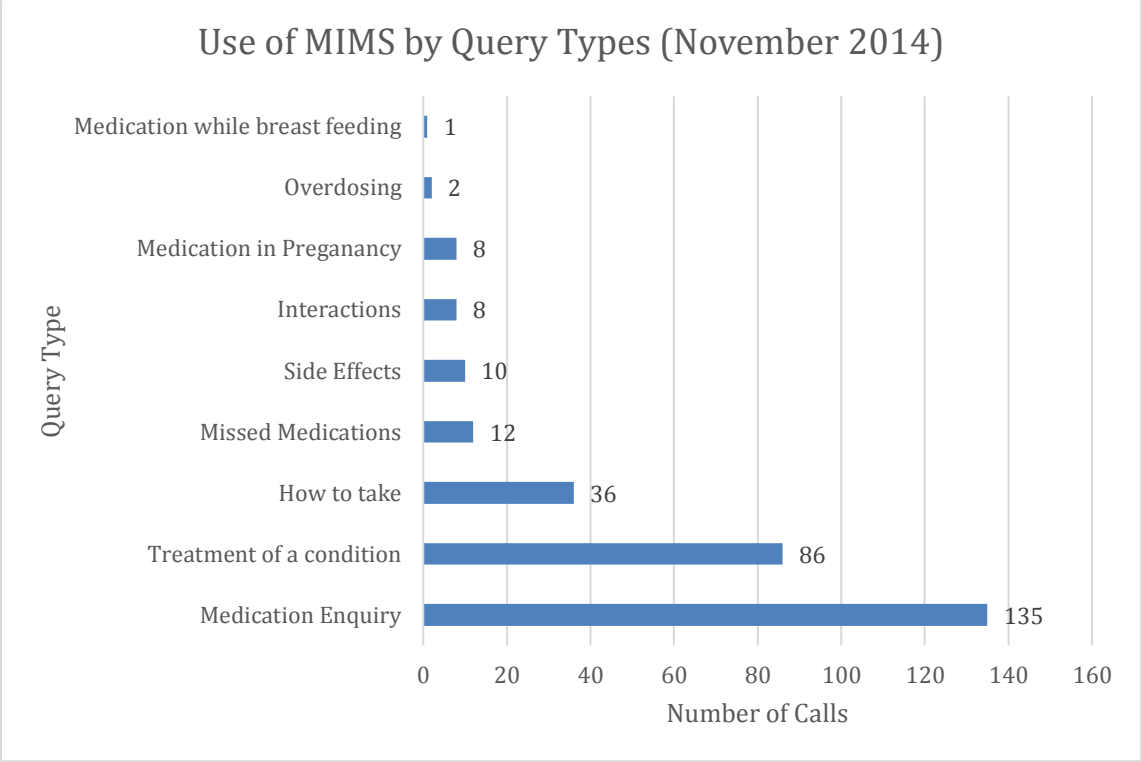


Figure 2.2.9 Use of MIMS by query types

Data quality issues

The following issues were identified which made analysis of the GP after hours service data challenging at times:

- There were blank cells/NA in describing the patient's problem. It was therefore not possible to classify those calls (n=24) by query type.
- For those calls where a description was available, it often comprised of a single word (e.g. anxiety) or was too abstract (e.g. medication error) to be assigned to a meaningful category.
- As no session end time was available, it was not possible to calculate the duration of the calls for the GP data set.
- An inconsistency was identified in patient age recorded in queries related to use of medications during breast feeding. In one case, patient age was recorded as <1 year, in all others, the mother's age was recorded.
- Possible data entry errors were identified in the GP call session start times as GP session start time was missing in 181 cases. GP call sessions also started before

nurse sessions ended (n=12 excluding 6566 calls with differences within 1 second).

- We identified an implausible value for length of call transfer time (one was longer than 6 days).

SUMMARY OF RESULTS

Overall, our analysis showed that 6.51% (n=13,600) of the 208,837 calls transferred to the after hours GP helpline in 2014 were medication-related. The number of calls peaked during the period of January-March 2014. A large proportion of calls (83.04%) were related to adult medications and NSW was the state which received the highest number of medication calls. The use of decision support tools by GPs was sparse, with MIMS being the most frequently adopted resource. The patient's original intention was often different to their final disposition.

Our in-depth analysis of the November 2014 data included classifying the patient problem as described by the GP into one of the ten query types. The analysis of classified data showed that 'Treatment of a condition' (39.08%) and 'Medication enquiry' (36.96%) were the most common query types across all age groups. The busiest hours were 22:00 – 8:00 with 46.68% of the calls made during this period. Overall for all types of queries, *Self Care Advice +Other* was the most frequent final disposition group. The use of the decision support tools was also sparse in November, with MIMS the most frequently used decision support tool for all query types.

Study 2.3 Analysis of health provider data

INTRODUCTION

The monthly health provider data set for 2014 included calls related to the health information and provider referral services provided by Healthdirect. The 12 monthly data sets were merged for a detailed descriptive analysis.

METHOD

As the focus of our study was medication-related calls, the medication information queries were extracted from the data based on the use of a medication information fact sheet. A pre-defined list of 68 medicine related fact sheets (Appendix 2) provided by Healthdirect was used as a reference to filter out the medication information queries from the health provider data set. Descriptive analysis was then carried out to identify the monthly distribution of medication information queries and the frequently used medication information fact sheets. The data were further analysed to determine the usage of medication fact sheets across different age groups and by time of the call.

RESULTS

Overall distribution

67% of the calls received during 2014 were from callers who required information about healthcare providers (Table 2.3.1). The remaining 33% of calls (n=53,057) were health education calls. During 2014, the highest number of health provider calls were received during December, followed by January, April and August. The highest number of health education calls were received in August 2014 (Figure 2.3.1). Throughout the year a consistent pattern was observed, where the number of provider referral calls was double (or more) the number the health education calls except during December where 74% of the calls were provider referrals.

Table 2.3.1 Monthly distribution of health provider calls

Month	Provider Referral Calls (%)	Education Calls (%)	Total Calls

Jan	9,966 (68%)	4,632 (32%)	14,598
Feb	7,851 (65%)	4,321 (35%)	12,172
Mar	9,006 (65%)	4,827 (35%)	13,833
Apr	10,160(62%)	4,677 (38%)	14,837
May	8,246 (66%)	4,322 (34%)	12,568
June	8,532 (66%)	4,432 (34%)	12,964
Jul	8,605(64%)	4,772(36%)	13,377
Aug	9,716(66%)	5,068 (34%)	14,784
Sep	8,135(66%)	4,165(34%)	12,300
Oct	8,705(68%)	4,104(32%)	12,809
Nov	8,216(69%)	3,762(31%)	11,978
Dec	11,026 (74%)	3,975 (26%)	15,001
Total	**108,164 (67%)**	**53,057 (33%)**	**161,221**

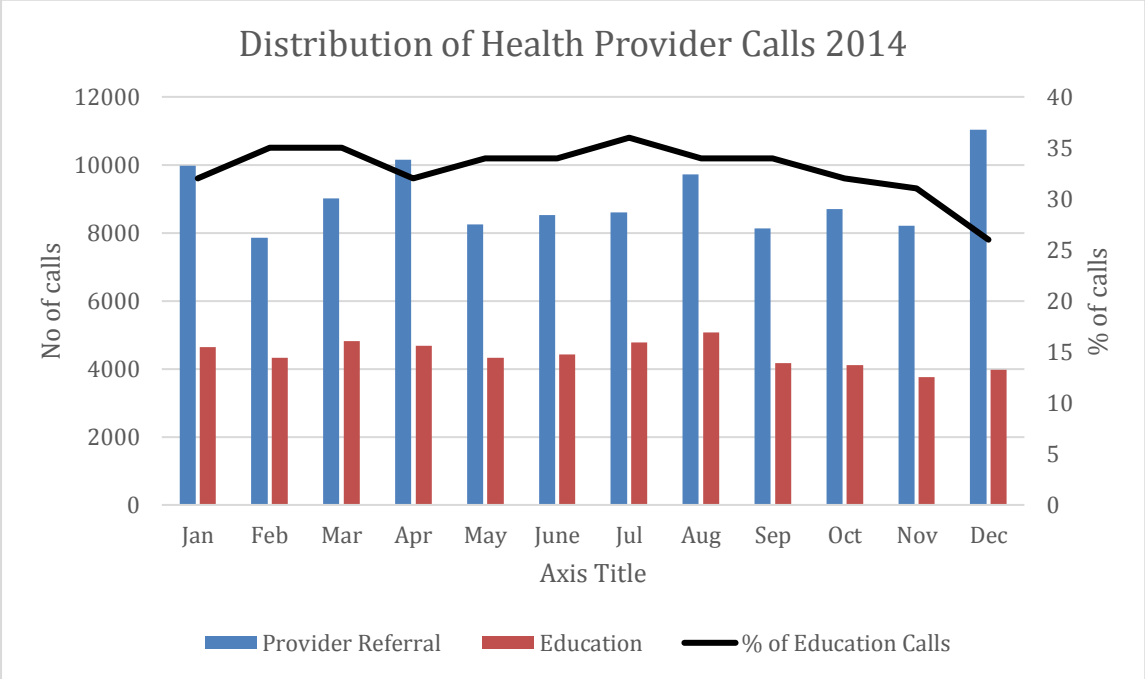


Figure 2.3.1 Monthly distribution of health provider calls

Volume of calls related to medication information

10.3% (n=5455) of the health education calls were medication-related and involved the use of a medication information fact sheet. The largest number of medication information related calls was received during August and July 2014 (the winter months). The number of calls declined during summer, that is, in October, November and December (Figure 2.3.2).

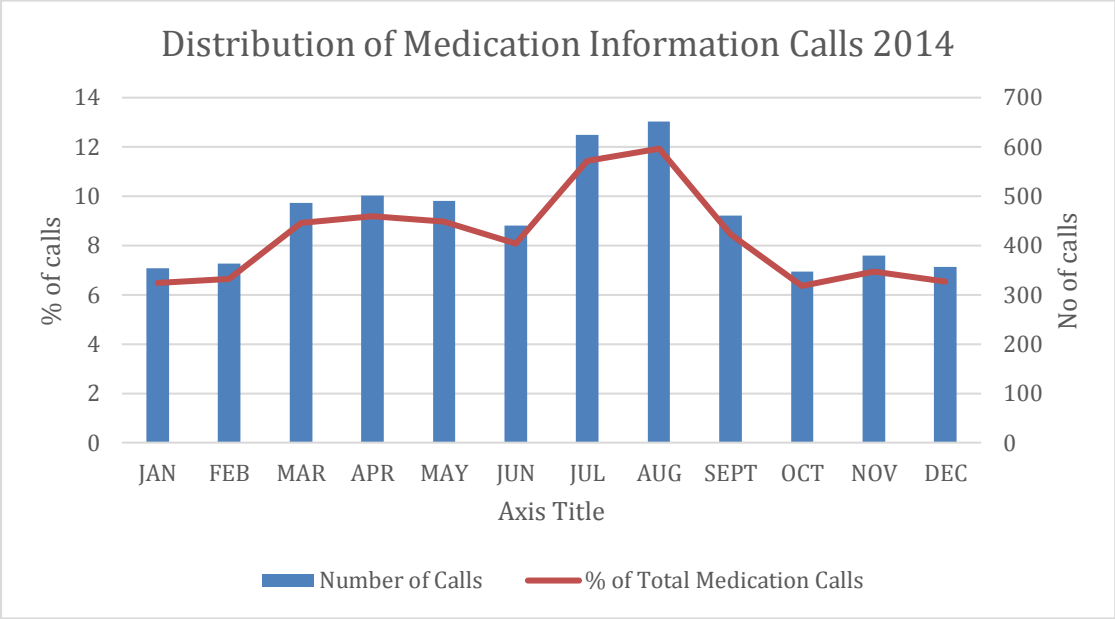


Figure 2.3.2 Distribution of medication information calls

The *Paracetamol Tip Sheet* was the most frequently accessed information sheet (n=2102, 38.5% of all medication-related calls). This was followed by the *Nurofen Tip Sheet* (n= 1325) and the *Paracetamol Dosing Guide* (n=860). The chart below presents the top ten information sheets used by providers when responding to medication-related queries in 2014 (Figure 2.3.3).

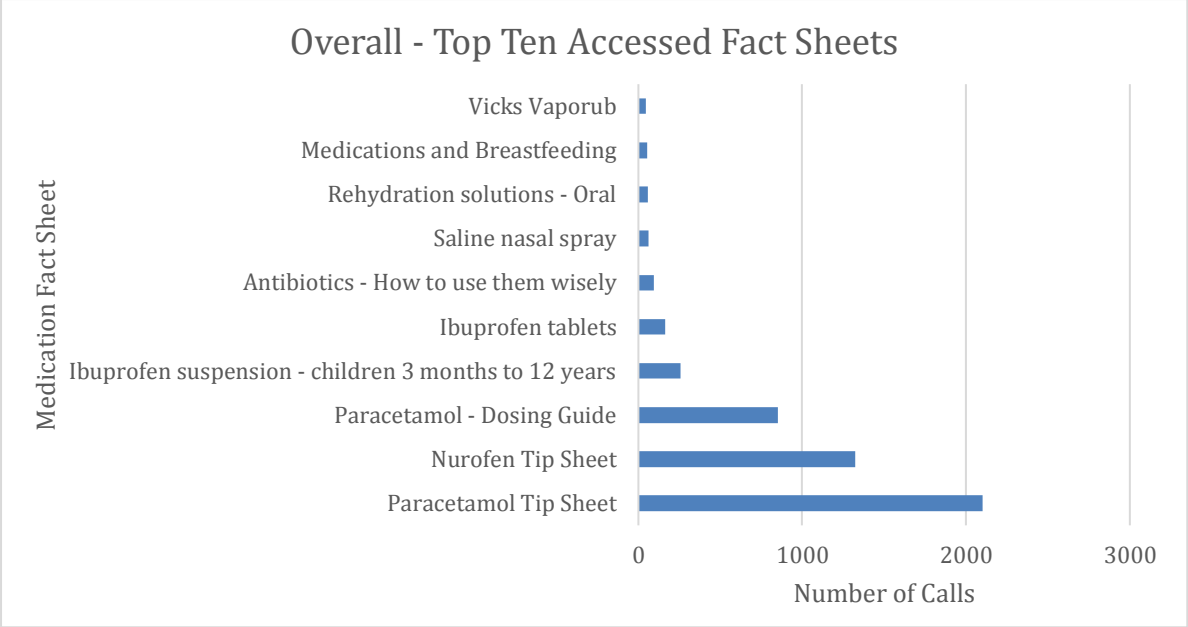


Figure 2.3.3 Top ten accessed fact sheets

The use of the *Paracetamol Tip sheet* peaked during July, August and September and declined over the summer months November, December and January (Figure 2.3.4).

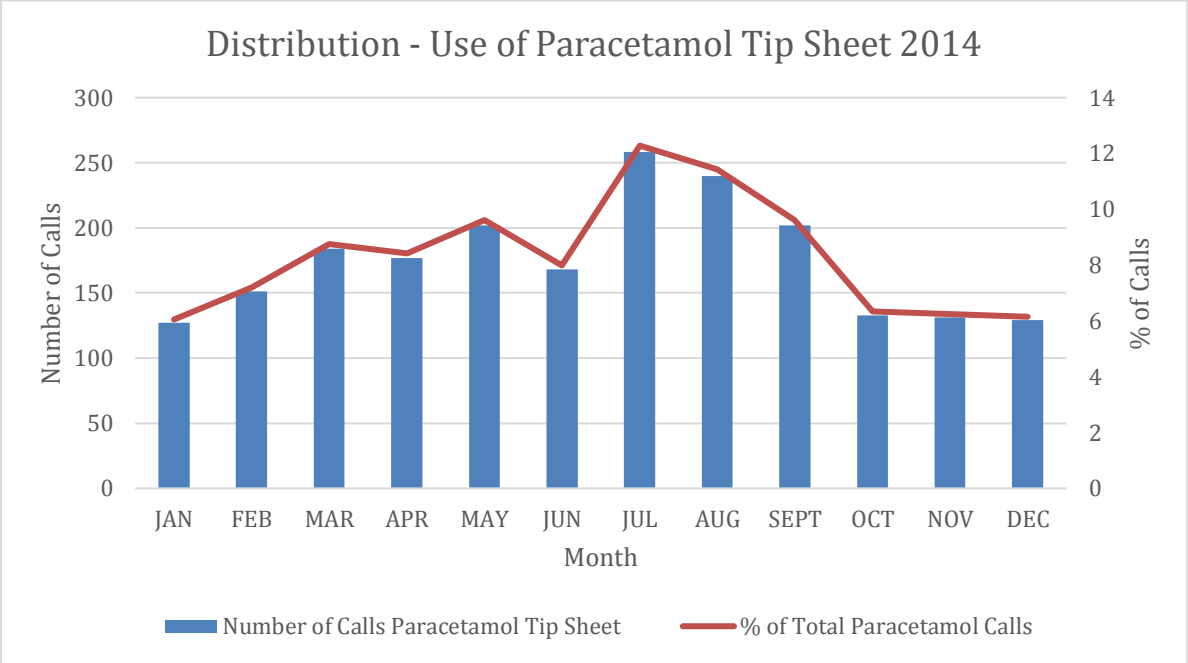


Figure 2.3.4 Use of Paracetamol Tip Sheet over time

Distribution by gender

61% (n=3319) of callers requiring medication-related information were female and 38% were male (n=2072*).* The *Paracetamol Tip Sheet, Nurofen Tip Sheet* and *Paracetamol Dosing Guide* were the most frequently accessed information fact sheets when responding to medication information queries by both female and male callers.

Distribution by patient age groups

Medication information related calls were most frequently received for patients in age group <1 (16.7%), those between 1-4 years (21.54%) and those aged between 26-45 years (28%).

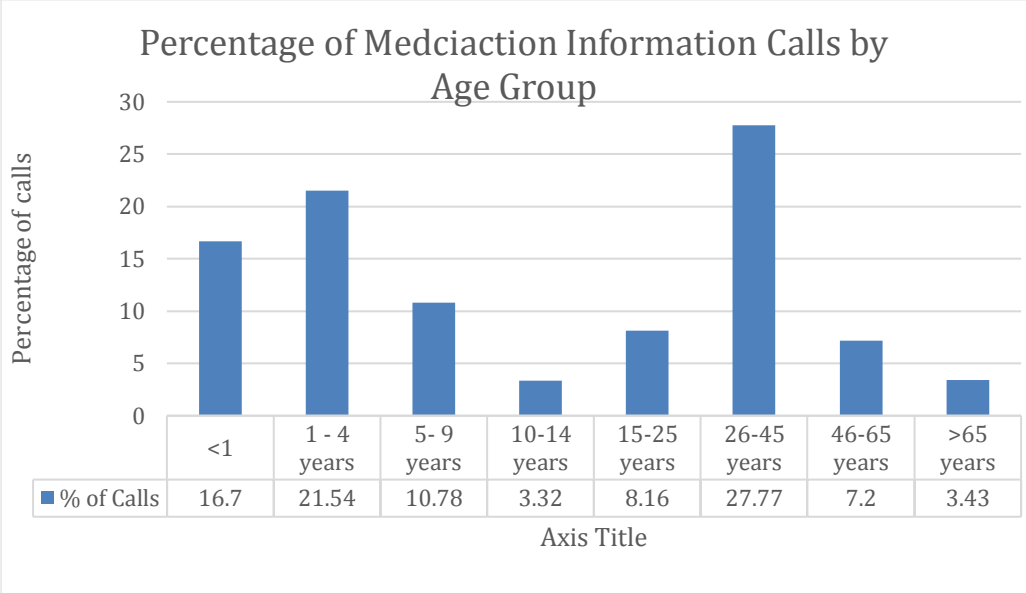


Figure 2.3.5 Distribution of medication information calls by age groups

The *Paracetamol Tip Sheet, Nurofen Tip Sheet* and *Paracetamol Dosing Guide* were the most frequently accessed information sheets when responding to queries related to all patient age groups. The table below presents the top ten information sheets accessed while responding to queries for the seven different age groups (Figure 2.3.5).

Despite the top three most accessed fact sheets remaining consistent across all age groups, there were differences in the other fact sheets accessed for different age groups. For paediatric age groups <1 year, 1-4 years, 5-9 years and 10-14 years, the *Ibuprofen suspension – children 3 months – 12 years* was the fourth most accessed

fact sheet during 2014. For paediatric age groups 5-9 years and 10-14 years the other frequently accessed fact sheets included *Antibiotics-How to use them wisely* and *Ibuprofen tablets*. For adult age groups 15-24 years, 25-45 years, 46-65 years and >65 years the *Ibuprofen tablets* sheet was the fourth most accessed fact sheet during 2014. As the age group 26-45 years is expected to include mothers, *Medications and Breastfeeding* (n=41) was the fifth most accessed fact sheet for this age group. For elderly age groups >65 years, the *Docusate Sodium-Laxative* sheet was the fifth most accessed medication fact sheet (Table 2.3.2).

Table 2.3.2 Top accessed fact sheets by age groups

Age Group	Top Accessed Fact Sheets	Number of Calls	Percentage
< 1 year	Paracetamol Tip Sheet	305	33.48
	Paracetamol - Dosing Guide	222	24.37
	Nurofen Tip Sheet	163	17.89
	Ibuprofen suspension - children 3 months to 12 years	70	7.68
	Saline nasal spray	39	4.28
Total Calls		**911**	
1-4 years	Paracetamol Tip Sheet	494	42.04
	Nurofen Tip Sheet	337	28.68
	Paracetamol - Dosing Guide	174	14.81
	Ibuprofen suspension - children 3 months to 12 years	84	7.15
	Medicines for your child	16	1.36
Total Calls		**1175**	
5-9 years	Paracetamol Tip Sheet	208	35.37

	Nurofen Tip Sheet	170	28.91
	Paracetamol - Dosing Guide	117	19.9
	Ibuprofen suspension - children 3 months to 12 years	48	8.16
	Antibiotics - How to use them wisely	9	1.53
Total Calls		**588**	
10 - 14 years	Nurofen Tip Sheet	62	34.25
	Paracetamol Tip Sheet	53	29.28
	Paracetamol - Dosing Guide	36	19.89
	Ibuprofen suspension - children 3 months to 12 years	13	7.18
	Ibuprofen tablets	13	7.18
Total Calls		**181**	
15-25 years	Paracetamol Tip Sheet	180	40.45
	Nurofen Tip Sheet	114	25.62
	Paracetamol - Dosing Guide	44	9.89
	Ibuprofen tablets	23	5.17
	Antibiotics - How to use them wisely	10	2.25
Total Calls		**445**	
26-45 years	Paracetamol Tip Sheet	607	40.07
	Nurofen Tip Sheet	353	23.3
	Paracetamol - Dosing Guide	187	12.34
	Ibuprofen tablets	68	4.49
	Medications and Breastfeeding	41	2.71

Total Calls		**1515**	
46-65 years	Paracetamol Tip Sheet	147	37.4
	Nurofen Tip Sheet	90	22.9
	Paracetamol - Dosing Guide	39	9.92
	Ibuprofen tablets	33	8.4
	Antibiotics - How to use them wisely	12	3.05
Total Calls		**393**	
>65 years	Paracetamol Tip Sheet	86	45.99
	Nurofen Tip Sheet	25	13.37
	Paracetamol - Dosing Guide	19	10.16
	Ibuprofen tablets	11	5.88
	Docusate sodium - Laxative	7	3.74
Total Calls		**187**	

Distribution by time of day

55% of the health education calls in 2014 were received outside business hours. 21% of the health education calls were made during the 22:00 – 8:00 time period (Figure 2.3.6).

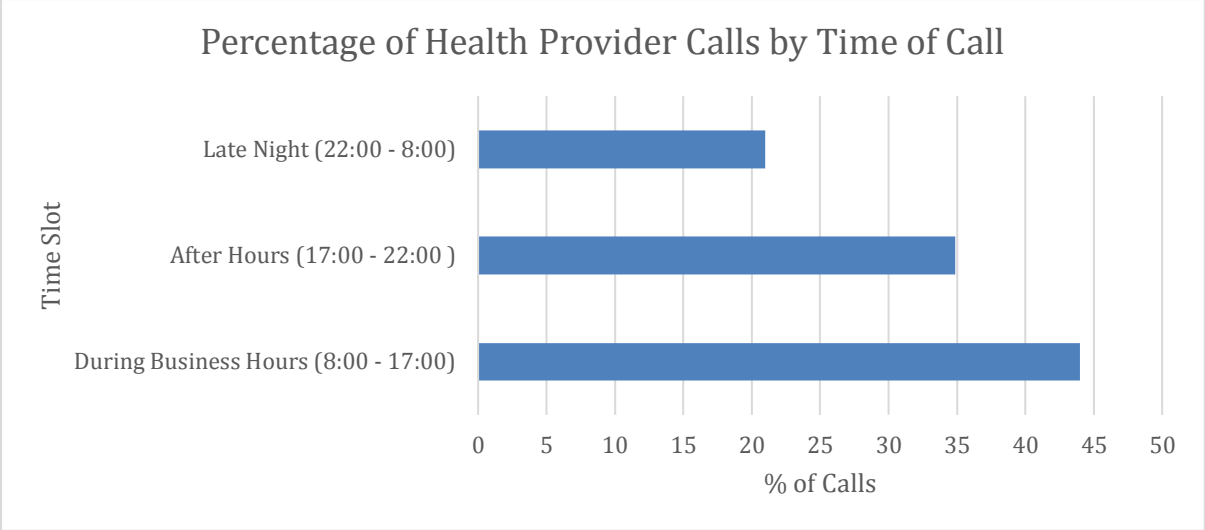


Figure 2.3.6 Distribution of health provider calls by time of call

For medication information calls, almost 74% were made outside business hours, with around 31% made between 22:00 – 8:00 (Figure 2.3.7).

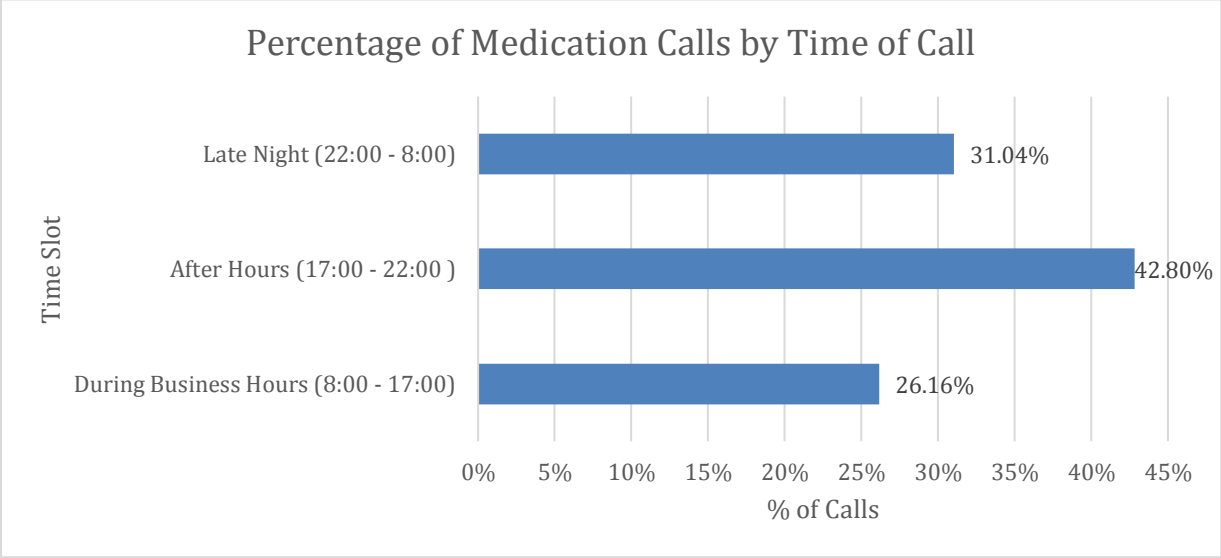


Figure 2.3.7 Distribution of medication information calls by time of call

SUMMARY OF RESULTS

Overall, 10.3% of the health education calls received in 2014 were related to medication information, with the highest number of calls received during the winter months (July and August). The *Paracetamol Tip Sheet*, *Nurofen Tip Sheet* and *Paracetamol Dosing Guide* were the most frequently accessed information fact sheets across genders and different age groups. Slight variation in the use of different fact sheets was observed for different age groups with *Ibuprofen suspension - children 3 months to 12 years* the fourth most accessed fact sheet for the paediatric age groups and *Ibuprofen tablets* the fourth most accessed fact sheet for the adult age groups. 74% of medication information calls were made outside business hours.

STUDY 3. REVIEW AND ANALYSIS OF CURRENT TELEPHONE PRACTICES AND GUIDELINES

AIM

To describe current practices related to medication queries, identify perceived barriers and facilitators to providing optimal advice over the telephone, and to identify well-designed components and poorly designed components of the current guidelines.

METHOD

To review current practices and guidelines, we adopted a human factors approach and employed three methods: 1) stakeholder discussions, 2) heurstic analysis, and 3) interviews with users.

Stakeholder discussions

An initial discussion (1.5 hour) with the senior policy analyst at Healthdirect facilitated in scoping the study. A review of the paper based version of the medication-related guidelines and of relevant literature was performed to formulate a potential list of heuristics for evaluating the web based version of the guidelines (Appendix 3).

A follow up discussion session (1.5 hour) between members of the research team (MB, AT) and the clinical lead telephony services at Healthdirect facilitated in familiarisation with the process undertaken by nurses to triage medication queries. A workflow model of the query handling process was then developed and used as a reference for conducting the heuristic analysis (Appendix 4).

Heuristic analysis

The online system used by nurses to access the guidelines is known as "Call Enhance Call Centre" (CeCC). Observations of the CeCC system were undertaken using an online meeting environment (GoTo meeting). A pilot online meeting was held to ensure technical issues would not arise during the analysis. The observation session (2 hours) was undertaken by two members of the research team (MB, AT). A senior practice manager at Healthdirect with two years experience using the CeCC system demonstrated the system to researchers. Three scenarios based on common

medication queries were ‘walked through’ by the practice manager during the demonstration. Data collected by researchers during the session included screenshots of the system (in use) and an audio recording of the discussion accompanying each scenario (which was later transcribed verbatim). Researchers also took notes during the demonstration.

The two researchers first undertook an independent analysis of the CeCC system in terms of usability, error potential and overall design quality. Both team members noted any violations in the heuristics. Following this, iterative discussions were held between the two reviewers to identify and finalise a list of common problems, categorise them into relevant heurstics, and assign an appropriate severity level to each violation identifed (severity scale appears in Appendix 5).

Interviews with users

Healthdirect assisted in the identification of telephone providers for interview. Nine nurses participated in a short semi-structured interview over the telephone. Nurses were asked to describe common medication queries they received, to discuss features of the CeCC system and guidelines that they liked and disliked, and to identify any ways the process or guidelines could be improved (Interview questions appear in Appendix 6).

RESULTS: HEURISTIC ANALYSIS

Identified Voilations and Severity

1. Task: Searching for a client's pre-existing records

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Flexibility and efficiency of use **Related:** Aesthetic and minimalist design Error prevention	Searching for a caller to retreive any previous records is a principal system feature. The following voilations are associated with use of this feature: • The search is not driven by a standard identifier and does not have any auto-correct /auto-suggestion feature when the user is typing in the search terms. The results retreived (see Figure 1) indicate that the same person may have had multiple encounters which were recorded as separate instances, therefore creating different records for the same person (same first name, last name and date of birth). • No filters are available to sort results by date, encounter type etc.	**3**
	• The search dialog has a large section of empty space between the search parameters (Date of Birth) and the retreived results. This may hamper the visibility of results especially the "Person Overview" section which is pushed to the bottom of the screen (and may then require scrolling).	**2**
Principal: Recognition rather than	When using the search feature the caller may be calling about another	

recall **Related:** Flexibility and efficiency of use	client whose record already exists in the database, nested within the record of the actual caller. This is indicated by a "+" sign in the extreme left column of the search results table (Figure 1) in the interface. • It is also not clear if the nested relationships are bi-directional (searching for the nested person may identify the primary person?). • The column does not include a heading or any cues (color etc.) to prompt the user to expand the '+'.	**2**

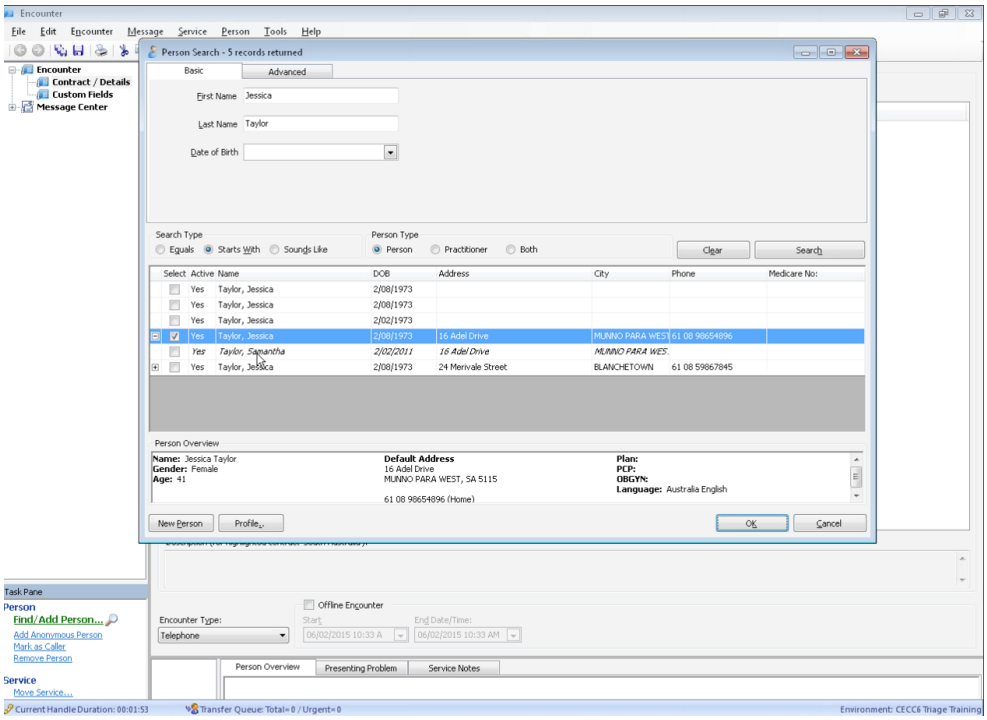


Figure 3.1 Searching caller by name (the + option on the left shows nested caller entries for the same caller, and may include the details of the actual patient the caller has called about)

2. Task: Conducting initial assessment

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Aesthetic and minimalist design Flexibility and efficiency of use **Related:** Error Prevention	The "assessment" is the primary interface (for all encounters including the ones related to medications) where the nurse enters information regarding the problem. • The top information pane on the interface contains redundant and confusing information (see Figure 2). • Fields like Duration/Onset which should be formatted as numbers also appear to be free text.	**1**
	• Both compulsory fields (primary assessment and presenting problems) are free text. No format and spelling checks available.	**3**
	• Both mandatory and optional fields appear in the first instant.	**2**
	• The interface lacks clear visibility of headings and spaces. Font size is inadequate for reading on a laptop or smaller screens.	**2**
	• Nurses do not use the bottom portion of the screen (person overview, etc). Including this information reduces the overall screen space available for the main content.	**1**

Principal: Match between the system and real world **Related:** Flexibility and efficiency of use	Under the "Person Profile" tree structure the last item, "Links", directs the user to external reference sources (e.g. eMIMS). • This heading does not provide meaningful direction for the user.	**1**
	• The user has to navigate through a long list of sources so is likely to open the required source externally (i.e. not via CeCC) rather than using he navigational path provided by the system.	**2**
	• The list contains items for all types of users, including the ones only used by GPs (see Figure 3).	**2**

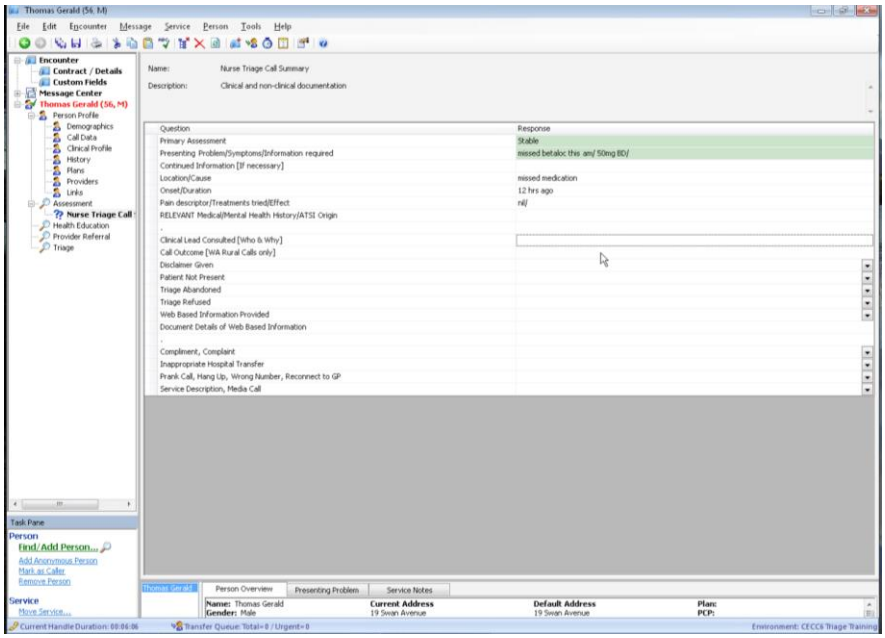


Figure 3.2 Free text - Presenting problem (other initial assessment questions)

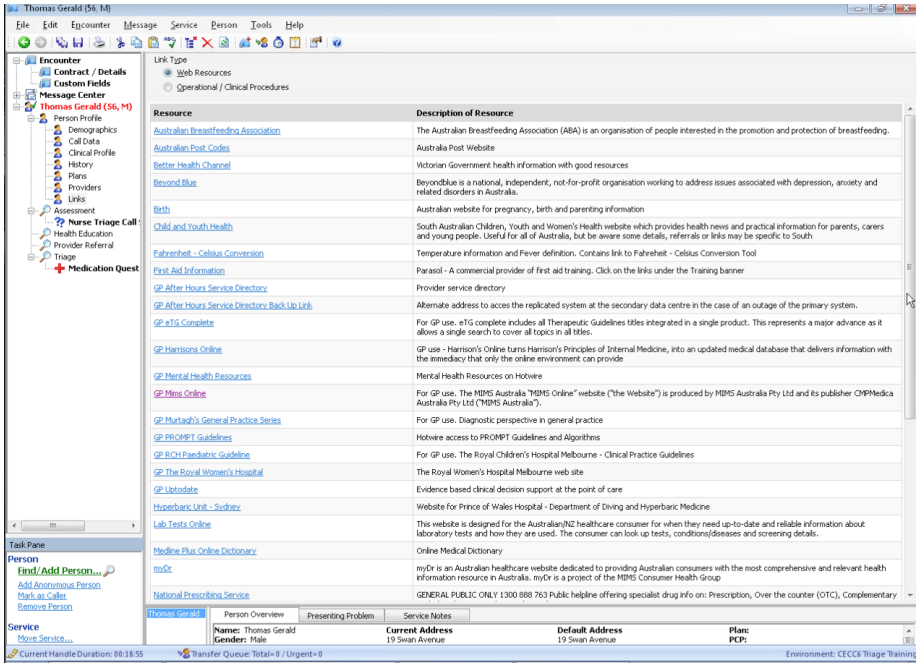


Figure 1.3 Expansion of the "Links" item from the "Person Profile"

3. Task: Selecting/searching the guidelines

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Flexibility and efficiency of use	• The guideline search interface does not have a spell check/auto-correct option (see Figure 4).	**3**
Related: Consistency and standards	• The information pane at the bottom of the screen with the heading "Summary of selected guideline", appears to contain a list of keywords (in very small CAPs) associated with the guideline.	**2**
Error prevention	• When a list of guidelines is generated, they are ordered in terms of acuity which may not be appropriate for the search scenario.	**2**
Aesthetic and minimalist design	• The interface is of poor visual quality (in terms of visbility of headings, font size and optimal use of screen space).	**2**

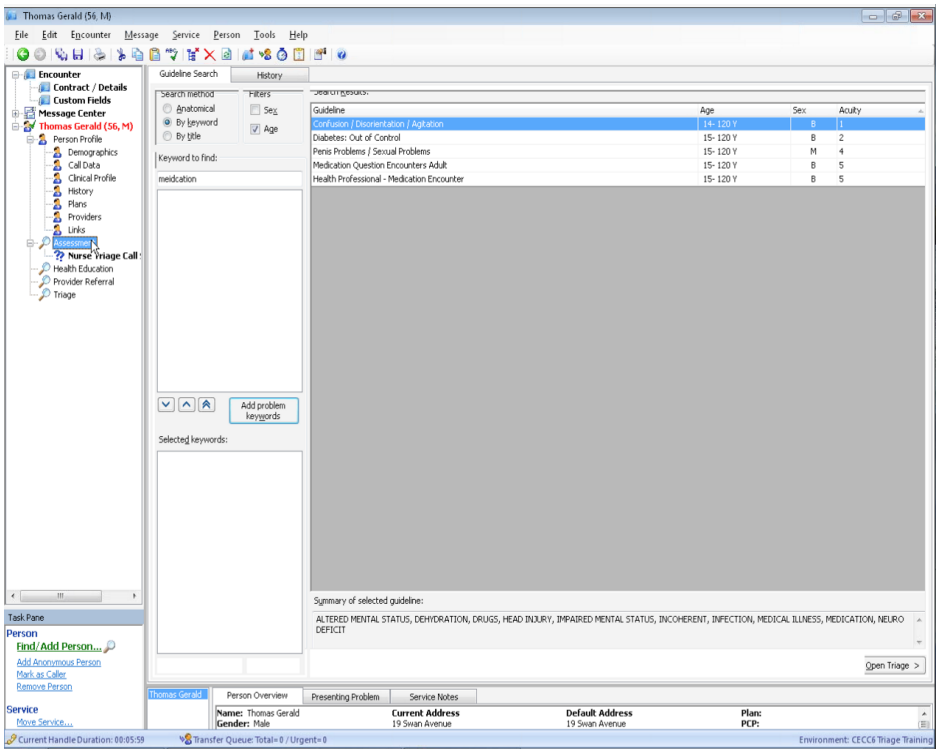


Figure 3.4 Selecting the guideline (according to the presented problem)

4. Task: Using the selected guideline

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Flexibility and efficiency of use Visibility of system status **Related:** Consistency and standards Error prevention Aesthetic and minimalist design	• The overview page of the guideline is very long and cluttered.	**2**
	• Poor visibility of primary headings at the top of the screen and poor visibility of content on the interface (see Figure 5).	**2**
	• Content heavy with no navigational/interactive features associated with the content (e.g. hyper link to open MIMS online).	**2**
	• The information to develop the online navigational structure (i.e. 'transfer to….') needs to be removed from the interface as it is for desiging navigation and is already incoporated in the system's navigation structure (see Figure 6).	**1**
	• Nurses have to sequentially answer all questions related to a disposition. There is no way for the nurse to 'select all' when they become familiar with the guideline and know that all options under a disposition are irrelevant. This may be relevant	**3**

	specifically if nurses have ruled out a disposition like calling emergency services.	
	• When directed to a more relevant guideline, the nurse is still required to select that guideline from a long list of guidelines that appear in a pop up box.	**2**
	• The patient disposition comes before the question, when it is more logical for this to go after the question.	**2**
	• Several conditional phrases which require the nurse to hold information in memory are used (e.g. Has urgent specific questions about taking a medication AND out of scope for the nurse to answer AND dose required before usual doctor is available AND one of the following…).	**3**
	• The options Y/N/ANA and other abbreviations are not expnaded (for novice users).	**2**
	• The patient's final disposition (which appears on the top of the screen) is not clearly visible (see Figure 5).	**1**

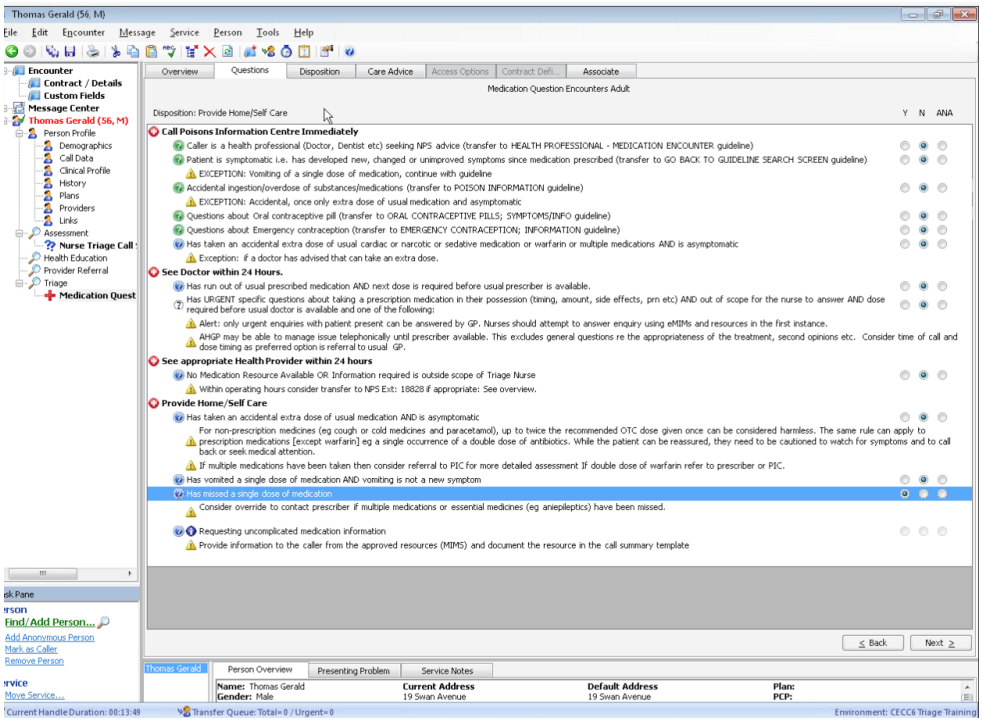


Figure 3.5 Medications guideline view - "Disposition" at the top

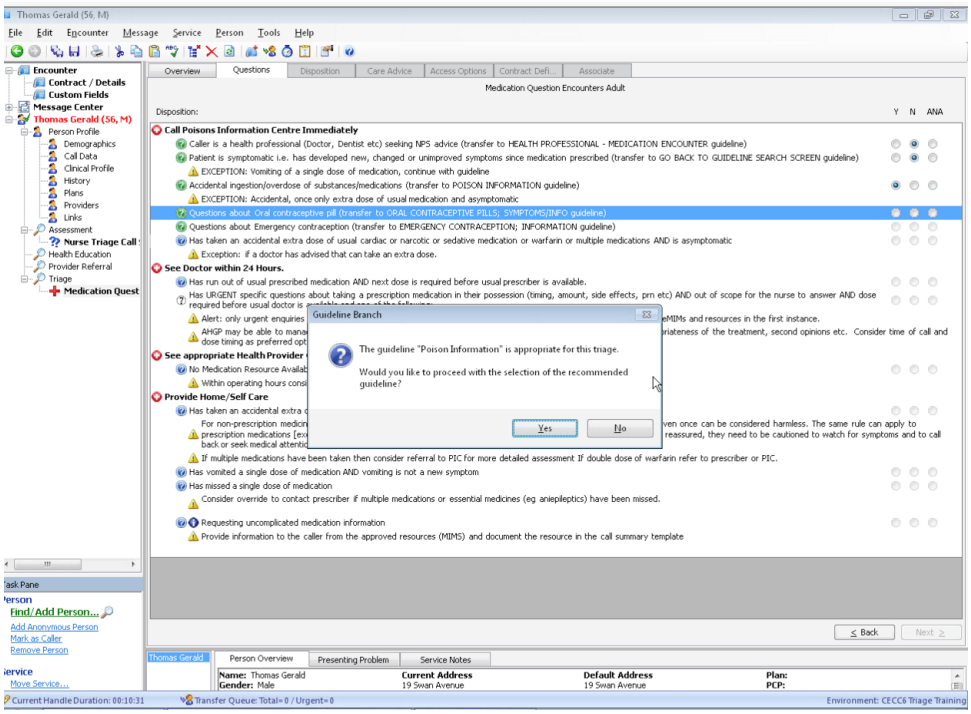


Figure 3.6 Guideline change suggestions- (Based on nurse's response to guideline queries)

5. Task: Finalising the disposition

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Aesthetic and minimalist design	• Poor visibility of content on the interface (small font size and inadequate use of screen space) (see Figure 7).	**2**

Related:
 	
Consistency and Standards
	• Inconsistency in use of display options:
	  ○ Dropdown for "Override disposition"
	  ○ Checkboxes (for not using the disposition and documenting reason)
	  ○ Text highlight on click for recording original and intended intention
		1

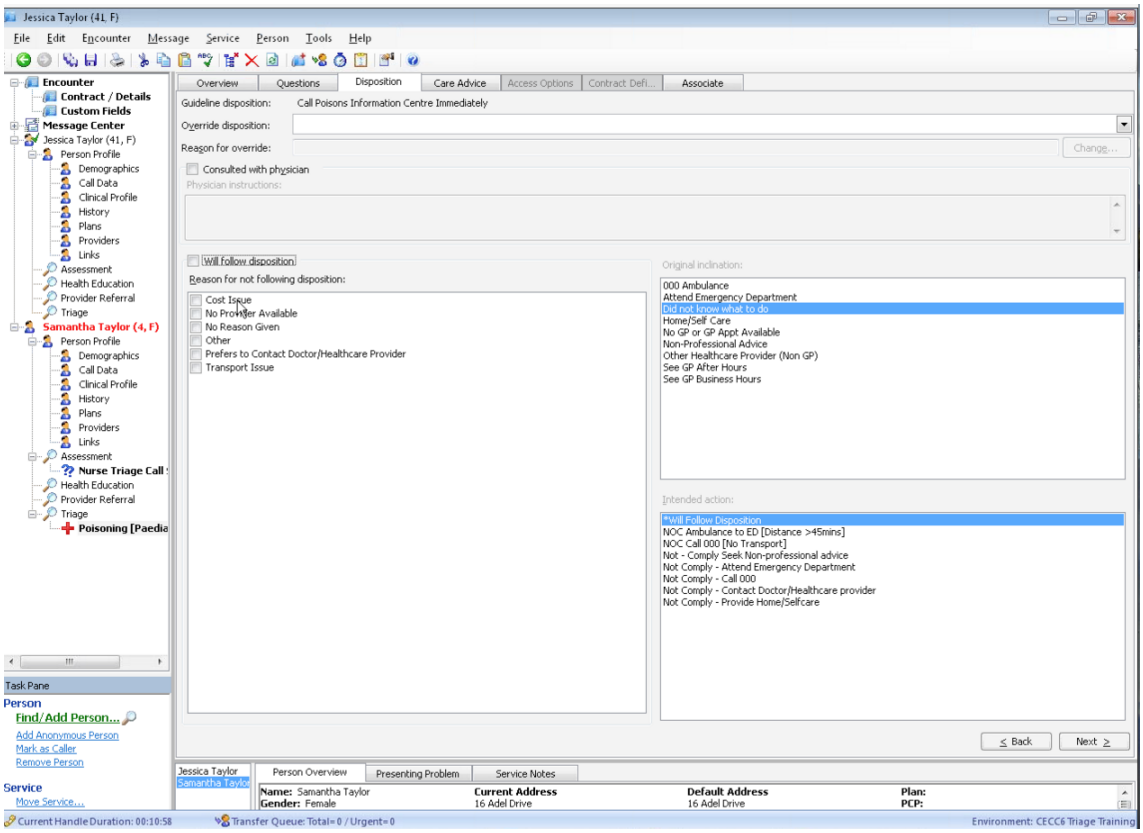


Figure 3.7 Confirming final disposition

6. Task: Recording client's refusal to follow a recommendation

Relevant Heursitic (s)	Observed Voilation(s)	Severity Level
Principal: Visibility of System Status **Related:** Recognition rather than recall	• The navigation path for a nurse to take when a cleint refuses to follow their recommedation is unclear. The nurse selects 'ANA' to indicate that a caller is refusing to adhere to advice (see Figure 8) but also records a client's refusal to follow their recommendation on the finalising disposition screen (see Figure 7) and needs to indicate that the care advice will not be followed on the 'care advice' page.	**2**

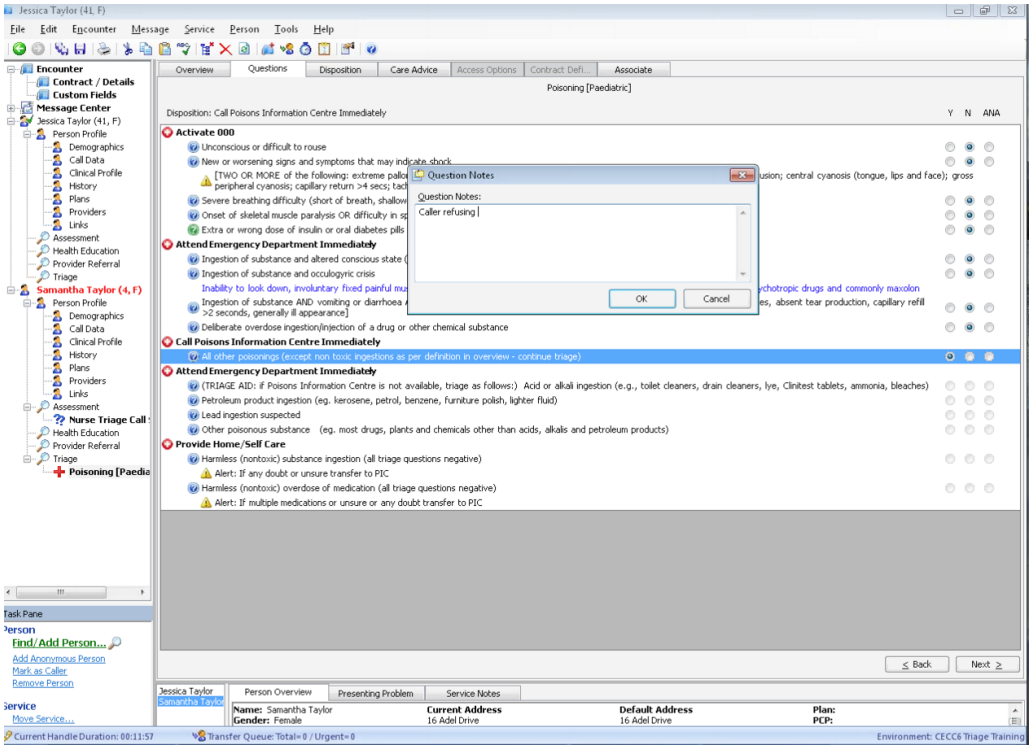


Figure 3.8 Scenarios where caller refuses to adhere to advice (activated by selecting ANA option and then documenting notes as free text)

7. Task: Searching for a relevant fact sheet

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Aesthetic and minimalist design	• Auto-correction and spell check are not available in the health education search interface.	**3**
Related: Consistency and standards Flexibility and efficiency of use	• Irrelevant keywords were picked up automatically from the problem description. The users were observed deselecting the irrelevant keywords (e.g. ringing) (see Figure 9).	**3**
	• The ordering of factsheets in a list is unclear (not alphabetical).	**2**

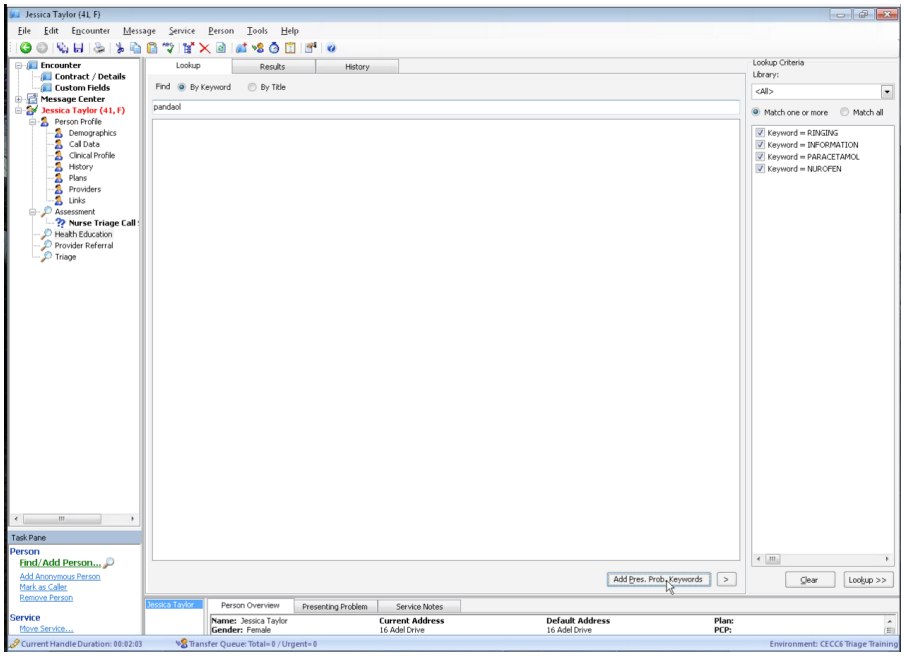


Figure 3.9 Searching fact sheets in the "Health Education" section

8. Task: Using the fact sheets

Relevant Heursitic (s)	Observed Voilation (s)	Severity Level
Principal: User control and freedom **Related:** Flexibility and efficiency of use	• The information sheets are static. Although the content outline appears on the left, the outline does not appear to be interactive (see Figure 10).	**2**
	• The version and reviewer information is listed on factsheets, increasing the volume of information that nurses are required to look over (see Figure 10).	**1**

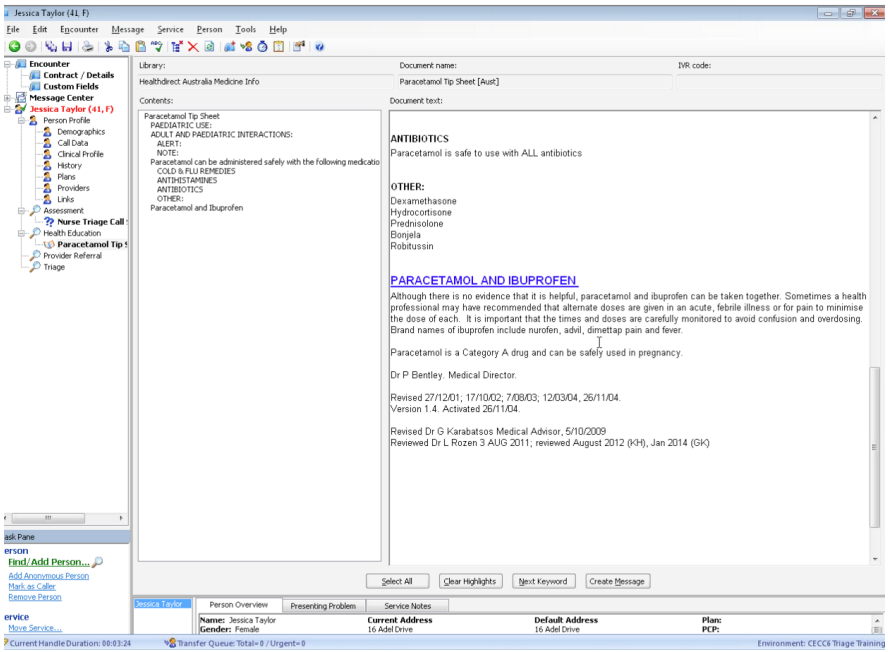


Figure 3.10 Paracetamol tip sheet

9. Task: Recording use of web-based information (e.g. MIMS online)

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Primary Flexibility and efficiency of use	• Documentation of use of web based information or reference sources involves entering information into two fields: 1) the type of information accessed and 2) the URL accessed. The headings do not clearly reflect the intended purpose of these fields (see Figure 11). The user must scroll back to the assessment section to record this information.	**2**

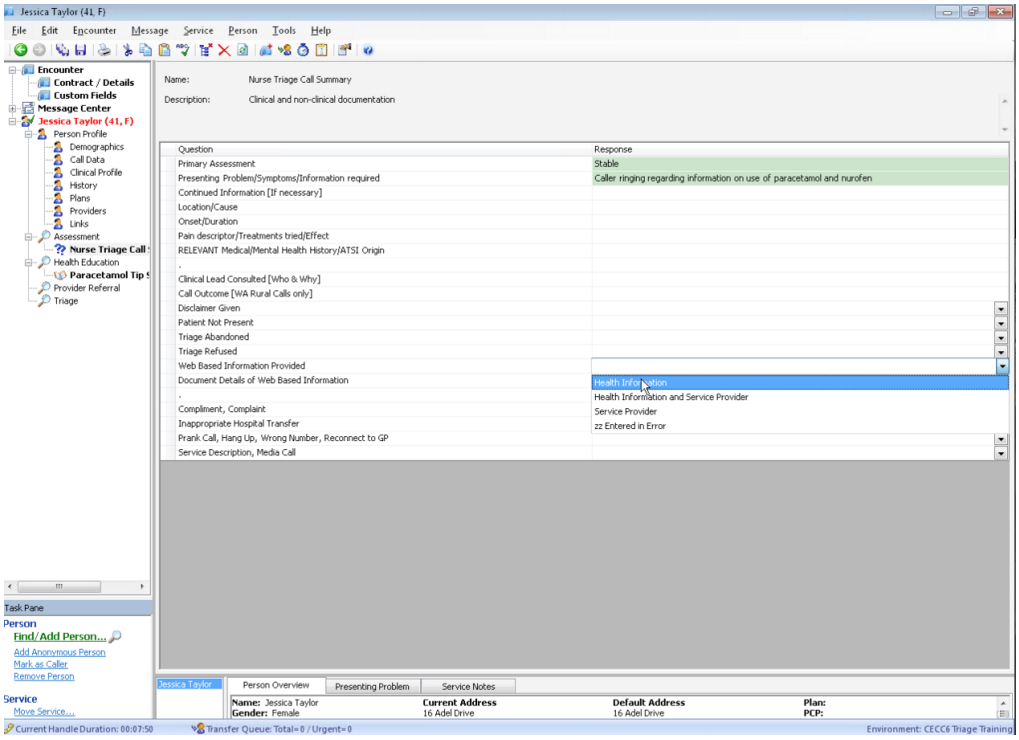


Figure 3.11 Documenting use of web-based information

10. Task: Searching for Referrals

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Flexibility and efficiency of use	• The ordering of referrals in a list is unclear. It does not appear to be alphabetical.	**2**
	• The referral information can be relayed verbally only. The system does not allow nurses to email or send information as a text message to the caller (Figure 12).	**2**

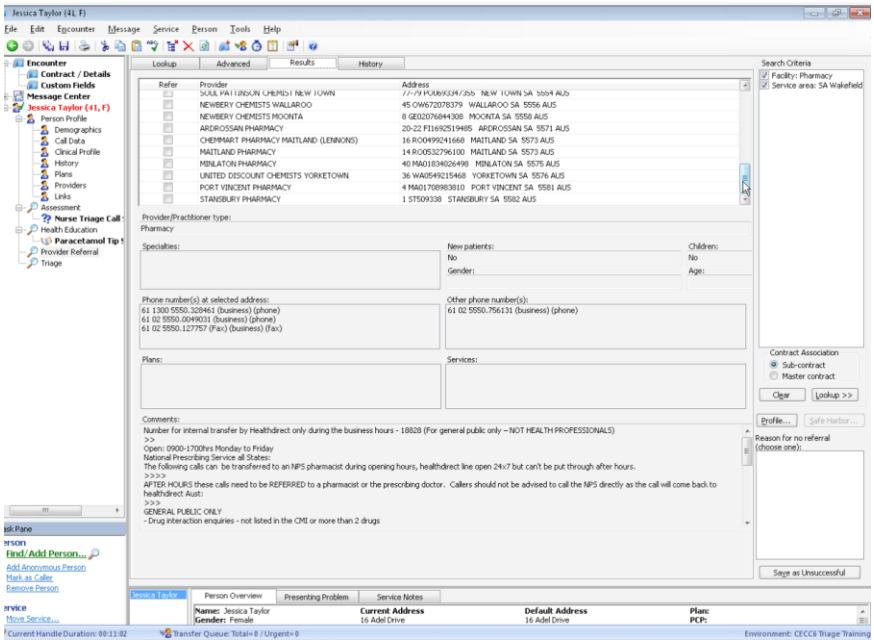


Figure 3.12 Referral search results

11. Task: Providing care advice

Relevant Heursitic(s)	Observed Voilation(s)	Severity Level
Principal: Aesthetic and minimalist design	• Nurses are required to tick boxes to indicate that they have given the care advice (Figure 13), when giving care advice appears to be mandatory.	2
	• The interface has poor visibility due to the small font size, lack of cues in the depiction of information and inadequate use of screen space.	2

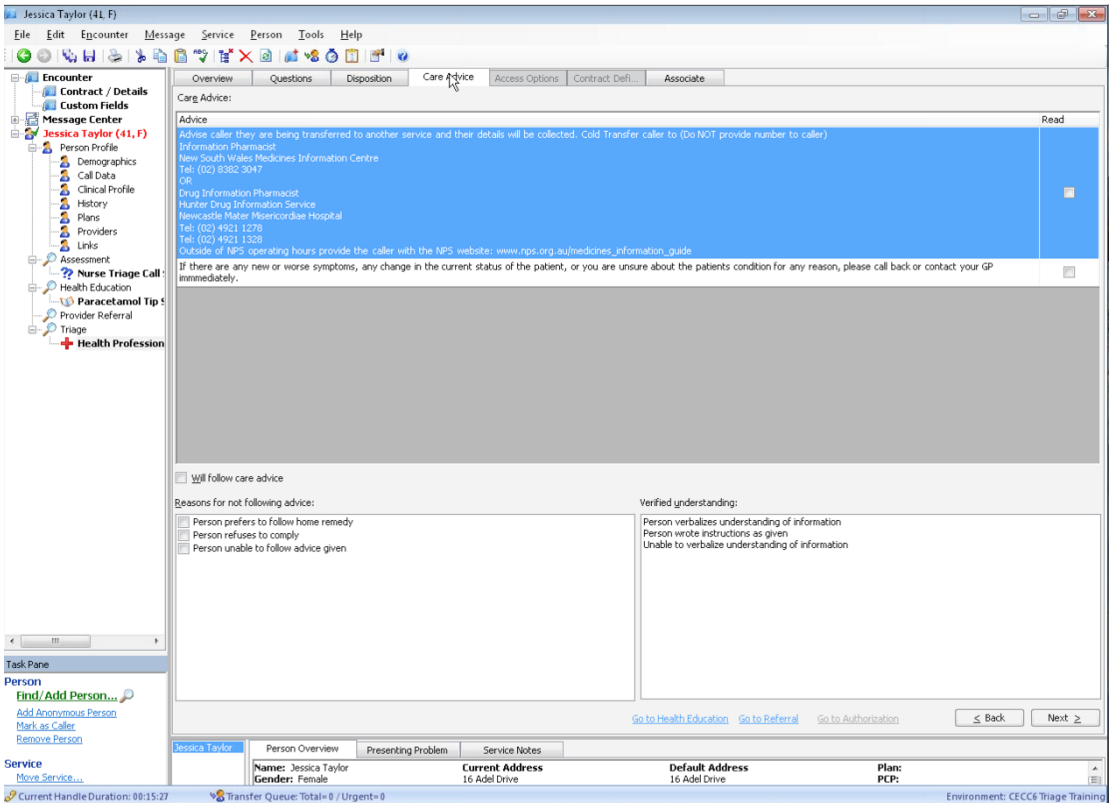


Figure 3.13 Care advice view

RESULTS: USER INTERVIEWS

Overall, nurses were very positive about the CeCC system and, in particular, the medication guidelines.

A nurse explained "*So it's very straightforward and there's no grey areas. So usually, I don't think I've ever had a medication question that I haven't been able to answer using that guideline." (N2)*

All nurses interviewed (but one) were very familiar with the process and the guidelines (3-7 years experience). This familiarity appeared to make it difficult for nurses to identify any problems with the system or to suggest ways it could be improved. For example, a nurse said

"*It's okay, yeah. I'm sure that it could be better but, I guess, I'm just used to it now, after four years." (N8)*

Medication guideline questions

When asked in particular about the wording of the questions in the medication guideline, nurses reported that they rarely read the content word-for-word. Instead, they tailored each question to sound more *"conversational."* A nurse explained

"You use them, yep. And, sort of, tailor that to the person that you're talking to whether English is their first language or – the other thing would be – and sometimes, quite often, you can gather straightaway, from the primary assessment, what their issue is." (N6)

When asked about the requirement to ask callers all questions in the guideline, even when confident that their query is a simple enquiry, only a small number of nurses could see value in this. A nurse said

"I totally agree with using the medication guidelines because, as I said, through my experience people are often - start off with one question but we end up in a very different area because really the question they're asking seems simple on the outside, but once you actually look into it it's not that simple on the inside and can have serious effects." (N1)

Some nurses admitted to not reading all the questions out to callers.

"If they say, look, I've just taken, accidentally, an extra dose of my antidepressant. I feel absolutely fine, but I just want to know do I need to do anything about this? To be honest, I just click no – no – no – no – no – no. I don't even ask the other ones, they're not relevant." (N7)

"Sometimes, you know, sometimes I'm guilty of perhaps not completing the guideline questions until after the caller has gone…and I know I'm not alone in that one. So sometimes it's a little bit frustrating, oh, I've got to go through and go, no, no, no, no, no, no, no, yes to this one, you know, but I suppose that can be a little bit annoying because it's - I'm asking - look, I'm answering questions that really aren't that relevant, but at the same token I understand why they're there." (N5)

Some nurses were very receptive to the idea of creating shortcuts in the system. For example, providing nurses with an option to acknowledge with a single mouse click that a disposition was not relevant, eliminating the requirement for all questions beneath that disposition to be asked. Another idea raised by several nurses was

"Maybe if there was a question that you've got the answer to and it's just a quick answer and you know where to find the information then you didn't have to use the guideline as such, but you could say general nursing knowledge used or whatever and tick a box that's the equivalent of a guideline but something that we can use for ourselves, and then as long as we've got the backup for the information, my documentation from eMIMS or whatever. So something where we didn't have to go through so many questions would be good if we were confident in the answer." (N2)

One nurse suggested customising the guideline so that only relevant questions appeared for the patient type.

"Whether there's scope in there to have, say, a medication enquiry for a male versus a female. So you miss out on those kind of calls, but – those kind of questions, which are quite redundant for your male callers… So if you have initial question in there, male or female to start with, that would then could set up your information pathways to either be a male type caller or female type caller." (N9)

Overview page

When asked about the overview page, most nurses explained that they did not access the overview very often. When prompted about the layout of the content on the page, a number of nurses brought up the overview page during the interview because they could not recall the content or layout. This stimulated some negative feedback about the page.

"I would say the overview screen is a bit busy." (N6)

"I think if it was clearer, yeah, definitely. I mean, there's a lot of stuff there. It could be probably summarised, probably worded better, laid out better, yeah." (N8)

Health information sheets

Nurse opinions of the factsheets were mixed. Some nurses explained that they rarely used the factsheets because they were quite familiar with the content.

"To be honest, I know it off the top of my head and I just rattle it off before I open it. But, of course, we are meant to document what we've told them. I tend to just then go in and find it, highlight it and then put it in afterwards." (N6)

"I would go to eMIMS these days now before going to the fact sheets just simply because I probably know all the information in the fact sheets because I've been using them for so long." (N1)

One nurse found the factsheets very useful.

"I think they're great. I think they're wonderful, yeah, and I'd like to have as many fact sheets in here as we possibly can because then at least you can – what I like about it is you can actually document in your report or in their file, in their records, what they've been told." (N4)

Most nurses explained that it would be beneficial to have more factsheets or more information included in each factsheet. Warfarin, insulin, and complementary medicines (particularly their interactions with prescription medications) were mentioned as areas where more information was needed. One nurse suggested providing a quick reference link for the top 10-20 medications that are the subjects of calls.

CeCC process

Most nurses reported completing the on-line documentation while on the phone, but a small number of nurses appeared to struggle with this. One nurse said

"*I do as much typing as I can while I'm talking, but I find that – I don't know whether I'm dyslexic, or what, but I just really need to listen to what they're saying, and so sometimes I get through a call quicker by listening to them and responding and then afterwards, when I hang up, that's when I finalise my documentation." (N3)*

When prompted to discuss the process of navigating through the steps of the CeCC system, some problem areas were identified. One nurse described the process of finding a caller in the system as challenging because often there are multiple files in the system for the same caller.

"And a lot of it is, you know, they might have multiple or duplicate files there that are there because they've either – spelling of their name has been incorrect initially. At least every day I'll have duplicate files that I've got to send off and say please merge these files and give them correct spelling, correct name, correct details." (N8)

Another nurse expressed frustration at having to collect a caller's demographic information for simple enquiries.

"*The demographics is a real pain in the neck, I'm not denying that. But it's there for a safety reason, like, I get that. So, yeah, but, you know, some people just ring with such basic enquiries that you just think, for God's sake, do I have to give all this information before I answer that? And you do." (N7)*

The provider referral process was also highlighted to be difficult.

"*It's very detailed and confusing information, sometimes, getting a provider referral. But you bring up a – it might be in rural Western Australia and you're trying to find the closest pharmacist, or something like that, and it's not easy. You can narrow it down to a postcode, but then you usually get nothing, so you bring it up to the next level which is their service area search, and then you'll get every one… and then you've got to go through each one to see if it's open, what hours it's open, and really it takes a lot of time." (N3)*

Training

When asked about the training they had received on the CeCC system and medication guideline, all nurses reported that the training had been very comprehensive. One nurse said

"I think that the training was very good, it was a fortnight in the classroom with an experienced triage nurse. And, certainly, you know, helping you to navigate around the system was very good. The other thing was the mentoring was very good." (N6)

Participants explained that it took a lot of practice to become confident using the system.

"So none of us were confident and comfortable with it in the beginning. It's taken years of practice and years of doing it that has made it easier for us to deal with." (N1)

Resources for providers and patients

Every participant said that they used eMIMS as their primary resource when answering medication queries. eMIMS was used first, before any other resource, and it was used frequently (in up to 95% of calls).

"I always look at the MIMS online because I regard that as they do the research and they update that regularly, and I still even look up Nurofen and Panadol even though, off the top of my head, I'm pretty sure of the answer, but I still double check it." (N4)

When asked how eMIMS was accessed, most nurses reported minimising the CeCC system and accessing eMIMS externally. Nurses who used two screens accessed the CeCC system on one screen and eMIMS on the other.

When faced with an enquiry that was out of scope, all nurses explained that they directed consumers to the NPS line, the Poisons Information line, the after hours GP line, or to their doctor or pharmacist. When asked about the best resources for consumers, most nurses indicated that Healthdirect was one of the best resources available. A nurse said

"I don't know of any other alternatives to be able to access that information on as as-need basis on a 24 hour a day, seven day a week basis." (N1)

STUDY 4. GAP ANALYSIS OF HEALTHDIRECT'S WEBSITE

Written information is an important aspect of enabling consumers to use their medications safety and effectively. Given that 30% of internet users seek medication information on-line,[1, 2] and the Healthdirect website is a common site for users to visit (540,000 visits between January and June 2014),[3] medication information on the Healthdirect website is likely to be a very valuable resource for consumers.

AIM

To review the medication information on the Healthdirect website and compare this with the information contained on other consumer health information websites in order to identify any content gaps in the Healthdirect website.

METHODS

Identification of websites

The medication information on the Healthdirect website was compared to that contained on three other Australian consumer health information websites. To identify these additional websites, common medication queries received by the Healthdirect telephone line were entered into Google and the three most frequently generated websites which provided advice for consumers were selected. Websites specific to a condition, a medication or a population group were excluded (e.g. beyondblue, Royal Children's Hospital Melbourne). The three websites included in our content review were:

- National Prescribing Service MedicineWise (NPS; http://www.nps.org.au/)
- MyDr (http://www.mydr.com.au/)
- Better Health Channel (BHC; http://www.betterhealth.vic.gov.au/)

Website content review

The medication information contained on each website was reviewed to determine whether it included information on: i) the most frequent medication queries received by Healthdirect's telephone line; and ii) the most commonly used medications in Australia.

Common medication queries made to Healthdirect

We reviewed all medication-related calls made to Healthdirect during November 2014 and extracted the name of the medication which was the subject of each call. Medications were then coded according to MIMS medication categories (e.g. antibiotics, antihistamines) and the three most frequently asked questions about each class were noted (e.g. what are the side effects, see full list in Appendix 7). Based on this analysis, the most frequent medication classes were identified to be analgesics, antibiotics, antidepressants, antihistamines, and anticoagulants and antithrombotics. To assess each website, we reviewed their content to determine whether it included information on the top three queries related to each medication class. For example, when providing information on antibiotics, we examined whether the website covered missed doses, interactions and stopping an antibiotic. Additionally, we examined whether the website provided information on the most commonly queried medication within each of these medication classes.

We also reviewed the most frequent medication factsheets used by Healthdirect providers during calls in November 2014 (Appendix 8). We identified four medications which were the subject of frequently used health education factsheets: paracetamol, ibuprofen, paracetamol and codeine. Therefore, in addition to the class types above, we examined the websites to determine whether they also included information on these medications.

Commonly used medications in Australia

To identify the most commonly used medications in Australia we used two data sources: Pharmaceutical Benefits Scheme (PBS)[4] and National Census of Medicines data.[5] The PBS data covers all medications supplied under the PBS, but does not capture private prescriptions, prescriptions under the PBS co-payment and non-prescription medications. Data on medications supplied under the PBS were available for July 2012-June 2013.[4] The top ten medications as measured by defined daily dose per thousand population per day (DDD/1000 pop/day), are shown in Appendix 9.[4]

In order to capture data on non-prescription medications, the National Census of Medicines was used. The most recent National Census of Medicines was conducted in

2009-10 and it included information on the medications taken in the last month and in the last 24 hours by 1608 respondents aged 50 years and older (37.3% response rate).[5] The top ten medications (prescription and non-prescription) according to the survey are shown in Appendix 10.

To assess each website, we reviewed their content to determine whether it contained information on the five most common prescription medications from the PBS data, and the five most common non-prescription medications from the National Census of Medicines data (excluding paracetamol as this was examined as part of common medication queries made to Healthdirect, described above). To determine what information should be provided on these medications, we used the three most frequent questions asked by callers to Healthdirect's telephone line. These were: 1) how to take a medication (how much to take, what do to if a dose is missed and what to do in an overdose), 2) are there any interactions, and 3) what are the side effects. In addition, we noted whether the website had a general page on the MIMS medication category for each of the ten medications (e.g. did the website include a page on antihypertensive medication?).

Assessment of information on websites

We used a coding system to convey whether each question was answered on the websites. Questions were either covered by the website (C), partially covered (PC), covered by another website that the target website referred users to (R), or not covered (and not referred) (NC). Table 4.1 shows examples of the difference between covering and partially covering a question.

Table 4.1 Examples of covered and partially covered questions

Question	Covered	Partially covered
What medications does aspirin interact with?	Lists medications that aspirin interacts with	Mentions that aspirin interacts with medications and recommends that user seeks advice from a healthcare professional
What dose should be	Lists exact dosages, how	Cautions user to be careful

taken of a medication?	often and for whom (e.g. children, pregnant women)	about dosing and recommends that they check with their healthcare provider
What do I do about a missed dose?	Instructs user precisely what to do (e.g. take the next dose as soon as possible)	Instructs user to take medications at the correct times to avoid potential poor outcomes or adverse effects

To determine whether a website contained content on a question, we entered the medication name or class into the search box (provided either on the website's home page or on their medication specific page). We followed links and all relevant subject headings to check for content. When the target website referred users to an external website(s), we checked the additional site(s) for relevant content.

RESULTS

A summary of the medication information contained on each website is shown in Tables 4.2 to 4.5.

Website coverage of common medication queries made to Healthdirect

When examining website content corresponding to the most common questions asked of Healthdirect staff over the phone, we found that the Healthdirect website partly covered most of the queries related to simple analgesics and antipyretics (Table 4.2). Information on what to do in case of an overdose was covered for paracetamol, and partly covered for paracetamol and codeine, but users were referred to another website to obtain this information for ibuprofen.

When comparing the four sites, we found that: a) no website contained information on whether it is safe to take another dose of paracetamol and codeine after vomiting; b) all sites contained information on what to do following a paracetamol and codeine overdose except for Healthdirect, and c) Healthdirect was the only site that referred consumers to other websites (Table 4.2).

Table 4.2 Website coverage of the most common questions asked of Healthdirect related to simple analgesics and antipyretics

	Healthdirect	NPS	myDr	Better Health Channel
Paracetamol				
How much to take (children)	PC	PC	C	PC
Interactions	PC	C	C	NC
Overdose	C	C	NC	C
Ibuprofen				
How much to take (children)	PC	PC	C	C
Interactions	R	C	C	NC
Overdose	R	NC	C	C
Paracetamol & codeine				
Interactions	PC	PC	PC	C
Overdose	PC	C	C	C
Vomited after taking, is it safe to take another dose	NC	NC	NC	NC
Covered	**11%**	**44%**	**67%**	**56%**
Partially covered	**56%**	**33%**	**11%**	**11%**
Referred	**22%**	**0%**	**0%**	**0%**
Not covered	**11%**	**22%**	**22%**	**33%**

C=covered; PC=partially covered; R=referred to an external site; NC=not covered (and not referred).

We also examined website content relating to antibiotics, antidepressants, antihistamines, and anticoagulants and antithrombotics. The Healthdirect website provided general information on all classes of medications except for antihistamines (Table 4.3). This profile was also seen for NPS and MyDr. Overall, Healthdirect directed users to external websites for most queries. When comparing the four websites we found a) no general information was provided by any website on antihistamines, b) information on missed doses of antidepressants was not covered by any website, c) information on missed doses of antibiotics was not fully covered by any website (NPS only partially covered this), d) Healthdirect was the only site that referred consumers to other sites for information, and e) Healthdirect referred consumers to other sites for further information on two of the three medication classes it had general information pages for. Lastly, the most common queries related to antibiotics, antidepressants and antihistamines were not all covered by any one site.

Table 4.3. Website coverage of the most common questions asked of Healthdirect related to the main medication classes

	Healthdirect	**NPS**	**myDr**	**Better Health Channel**
Antibiotics				
General information? (y/n)	Yes	Yes	Yes	No
Interactions	R	PC	PC	NC
How long to take it for	R	C	C	NC
Missed dose	NC	PC	NC	NC
Specific information on amoxycillin?	No	Yes	Yes	Yes
Antidepressants				
General information? (y/n)	Yes	Yes	Yes	Yes
Interactions	PC	C	PC	NC

Starting and stopping	PC	C	C	C
Missed dose	NC	NC	NC	NC
Specific information on sertraline?	No	Yes	Yes	Yes
Antihistamines				
General information? (y/n)	No	No	No	No
How much to take (children)	R	NC	NC	NC
Interactions	R	NC	NC	NC
Use in breastfeeding	R	C*	NC	NC
Specific information on promethazine?	No	Yes	Yes	Yes
Anticoagulants, antithrombotics				
General information? (y/n)	Yes†	Yes	Yes	No
Interactions	R	C	C	NC
Side effects	R	C	C	NC
Specific information on warfarin?	Yes†	Yes	Yes	No
Covered	**0%**	**55%**	**36%**	**9%**
Partially covered	**18%**	**18%**	**18%**	**0%**
Referred	**64%**	**0%**	**0%**	**0%**
Not covered	**18%**	**27%**	**45%**	**91%**

C=covered; PC=partially covered; R=referred to an external site; NC=not covered (and not referred).

*Information on use of antihistamines while breastfeeding was on a page about medication use in breastfeeding.

†Information provided on a page about stroke treatment.

Website coverage of the most commonly used prescription and non-prescription medications

As shown in Table 4.4, Healthdirect's website referred users to other websites for most information on commonly used prescription medications in Australia. This is in contrast to the other three websites examined, which covered all information themselves. Healthdirect's site did contain information on side effects of Atorvastatin and Rosuvastatin - this was displayed on a page that provided general information on statins. All websites had a general information page on hypolipidaemic and antihypertensive medications.

Table 4.4 Website coverage of common questions related to the most frequently used prescription medications in Australia

	Healthdirect	**NPS**	**myDr**	**Better Health Channel**
Atorvastatin				
How to take it*	R	C	C	C
Interactions	R	C	C	C
Side effects	C†	C	C	C
Rosuvastatin				
How to take it*	R	C	C	C
Interactions	R	C	C	C
Side effects	C†	C	C	C
General information on hypolipidaemic agents? (y/n)	Y	Y	Y	Y

Perindopril				
How to take it*	R	C	C	C
Interactions	R	C	C	C
Side effects	R	C	C	C
Irbesartan				
How to take it*	R	C	C	C
Interactions	R	C	C	C
Side effects	R	C	C	C
Candesartan				
How to take it*	R	C	C	C
Interactions	R	C	C	C
Side effects	R	C	C	C
General information on antihypertensive agents? (y/n)	Y	Y	Y	Y
Covered	**13%**	**100%**	**100%**	**100%**
Partially covered	**0%**	**0%**	**0%**	**0%**
Referred	**87%**	**0%**	**0%**	**0%**
Not covered	**0%**	**0%**	**0%**	**0%**

C=covered; PC=partially covered; R=referred to an external site; NC=not covered (and not referred).

*How to take it includes: how much to take, what do to if a dose is missed and what to do in an overdose. Inclusion of all three resulted in a rating of C, if only one or two items were covered, then a rating of PC was given.

†Covered on a general page about statins which mentions Atorvastatin and Rosuvastatin.

We also examined content corresponding to the most commonly used non-prescription medications in Australia (Table 4.5). With the exception of side effects of aspirin, Healthdirect referred consumers to other sites for all queries related to a specific medication. Healthdirect did not provide general information on complimentary medicines, but this was available on the other websites. Information on anticoagulants/antithrombotics was available through Healthdirect on a page about stroke treatment, while two of the three other websites had information pages on anticoagulants/antithrombotics. Fish oil supplements and glucosamine were the least comprehensively covered non-prescription medications, with no website covering all the queries related to these medications.

Table 4.5 Website coverage of most common questions related to the most commonly used non-prescription medications in Australia

	Healthdirect	**NPS**	**myDr**	**Better Health Channel**
Aspirin				
How to take it	R	PC	C	C
Interactions	R	C	C	C
Side effects	PC	C	C	C
General information on anticoagulants/antithrombotics? (y/n)	Y†	Y	Y	N
Fish oil supplements				
How to take it	R	PC	NC	PC
Interactions	R	C	NC	NC
Side effects	R	C	PC	NC
Glucosamine				
How to take it	R	PC	NC	NC

Interactions	R	PC	NC	C
Side effects	R	C	NC	NC
Calcium				
How to take it	R	PC	C	C
Interactions	R	NC	C	C
Side effects	R	PC	C	C
Cholecalciferol (Vit D)				
How to take it	R	PC	PC	C
Interactions	R	C	NC	C
Side effects	R	C	C	C
General information on complementary medicines? (y/n)	N	Y	Y	Y
Covered	**0%**	**47%**	**47%**	**67%**
Partially covered	**7%**	**47%**	**13%**	**7%**
Referred	**93%**	**0%**	**0%**	**0%**
Not covered	**0%**	**6%**	**40%**	**27%**

C=covered; PC=partially covered; R=referred to an external site; NC=not covered (and not referred).

*How to take it includes: how much to take, what do to if a dose is missed and what to do in an overdose. Inclusion of all three resulted in a rating of C, if only one or two items were covered then a rating of PC was given.

†Information provided on a page about stroke treatment.

SUMMARY OF FINDINGS

Overall, the Healthdirect website contained an equivalent amount or more information on the most commonly used prescription and non-prescription medications than the other websites we examined. One exception was Healthdirect's failure to provide

general information on complementary medicines. There were also gaps in Healthdirect's content on the most common medication queries made to the Healthdirect helpline. However, the other websites (NPS, MyDr, BHC) also did not cover this information comprehensively, suggesting that this may be a gap that Healthdirect could fill.

Queries on the most common prescription medications were covered on all websites, with Healthdirect referring consumers to external links for this information. The majority of the prescription medication information was available on CMI leaflets, either embedded into webpages or as a link to a PDF file. CMI content is regulated by the Commonwealth Government, and is prepared by and the responsibility of pharmaceutical companies.[6] Though CMIs provide consumers with the full gamut of information on a specific medication, it has been suggested that the amount of information they present may be overwhelming for consumers.[6] Furthermore, CMIs have been criticised for not promoting medication adherence because they include only limited information on the benefits of taking medications.[6] Thus, though it is not feasible for a website to develop its own content on every prescription medication, the inclusion of general pages on medication classes may provide consumers with more concise information than CMIs, including content on the benefits of taking a medication. Healthdirect's website did include general information on analgesics, antihypertensive and hypolipidaemic agents; but not antihistamines, anticoagulants/antithrombotics (except for that contained in a page on stroke treatment), and complementary medicines.

Healthdirect's website contained more thorough information on queries related to commonly used non-prescription medications than any of the other websites. Again, this was due to the fact that Healthdirect referred consumers to external websites for this information. However, Healthdirect did not have a general page on complementary medicines, despite the fact that four of the top five non-prescription medications used in Australia are complementary medicines.[5] Australian studies estimate that 50% of complementary medicine users also take conventional medicines[7] and over half of these people don't report complementary medicine use to their doctor.[7, 8] Additionally, 75% of complementary medicine users are unaware that the products are not tested for quality and safety by the Therapeutic

Goods Administration.[7] In light of this, it may be useful for Healthdirect to provide general information (not just medication-specific information) on the safe use of complementary medicines.

There were gaps in the content on all websites, including Healthdirect's website, related to commonly queried medications. No website covered all common queries related to the analgesics paracetamol, and paracetamol and codeine; and only one website (myDr) covered all queries related to ibuprofen. These analgesics are available over the counter (with the exception of formulations with codeine>12mg/unit) and are widely used. They are not prescription (S4) or pharmacist-only (S3), so they do not require a CMI according to Australian regulations. Instructions for use typically appear in or on the packaging. However, as is evident from the large volume of calls made to Healthdirect about these medications, consumers may not always read or keep packaging or instructions, may not understand the information provided, or all the required information may not be provided on packing and instructions. The Healthdirect website does contain information on some analgesics but it could consider covering the most common queries related to this class more comprehensively.

The other most commonly queried medication classes were antibiotics, antidepressants, antihistamines, and anticoagulants/antithrombotics. The Healthdirect website contained general information pages on antibiotics and antidepressants, but the content on these pages did not include answers to the most common queries made by consumers. The other websites also did not cover this material, so this potentially represents another gap that the Healthdirect website could fill. Healthdirect referred consumers to other sources for information on antihistamines and anticoagulants/antithrombotics, but could consider including general information on these medicines on their website. This is particularly important for antihistamines, as general information on this class was not available on any other website.

STUDY 5. USER TESTING OF HEALTHDIRECT'S WEBSITE

AIM

To identify well-designed and poorly designed features of Healthdirect's website and to identify other potential features/information to include.

METHOD

Participants

Sixteen consumers who were unfamiliar with the target websites were recruited to take part in user testing. Median age was 27 years (range 18-66) and 50% of the participants were male. When asked how frequently they used the internet, all participants reported that they used the internet 'multiple times a day'. When asked how often they used the internet to find medication information, typical responses were 'never', 'rarely' and 'once per month.'

To recruit participants, posters were displayed at the Macquarie university campus. Participants received a complementary lunch ($20 *Grill'd Burgers* voucher) for taking part.

Identification of comparison websites and development of scenarios

We compared Healthdirect's website to three other consumer websites. These were:

- National Prescribing Service MedicineWise (NPS; http://www.nps.org.au/)
- MyDr (http://www.mydr.com.au/)
- Better Health Channel (BHC; http://www.betterhealth.vic.gov.au/)

These additional websites were identified during our gap analysis (see Study 4 – Gap analysis of Healthdirect's website).

To develop relevant scenarios for testing, we reviewed medication-related queries made to Healthdirect's telephone line during November 2014. We identified 1) common medications that were the subject of calls, and 2) common questions asked about those medications. The eight scenarios used for website testing appear in Table 5.1. All scenario answers were available on the four websites.

Table 5.1 Scenarios used for website testing

1	Can I take Panadeine Forte while breastfeeding?
2	It is safe to take my antibiotic (Keflex) with Panadol (paracetamol)?
3	I missed a dose of my antibiotic (Amoxil: amoxicillin), what do I do?
4	What is warfarin (Coumadin) used for?
5	I'm feeling better, can I stop my antibiotic (erythromycin: Eryc)?
6	Is nausea a side effect of my antidepressant (Zoloft, a SSRI)?
7	Does warfarin interact with Nurofen (ibuprofen, a NSAID)?
8	Is it safe to take Telfast Decongestant Tablets while pregnant?

Procedure

To assess website usability, participants were observed while performing the eight scenario tasks using the websites. To complete each task, the user was required to answer each medication-related query by locating relevant information on a website. Each participant used each website (Healthdirect, NPS, MyDr and Better Health Channel) twice to locate a piece of medication information. Participants completed tasks in a fixed order but the order of website use varied between subjects to minimise any learning effects. Each participant was randomly allocated to one of the four sequences shown in Table 5.2.

Table 5.2 Order of website use for user trials

Sequence	**Website**			
1	Healthdirect	NPS	MyDr	BHC
2	BHC	Healthdirect	NPS	MyDr
3	MyDr	BHC	Healthdirect	NPS
4	NPS	MyDr	BHC	Healthdirect

Note: BHC= Better Health Channel, NPS = National Prescribing Service

The following variables were collected by the observer during each scenario:

- Time taken to locate the desired medication information
- The number of screens required to locate the piece of medication information
- The number of new searches a user performed (i.e. new entries into a search box)
- The number of times a user was required to go back (i.e. clicked back or closed a tab)
- The user's search method (e.g. whether they used the search box or browsed subheadings)
- Whether the user was successful in completing the task (i.e. answered the question correctly)
- Any obvious negative affect (e.g. frustration)

Following completion of four scenarios (i.e. two websites) participants took a short break and were asked to comment on the two websites they had just used. They were asked to indicate which website they preferred and why, to describe good and bad features of websites, to comment on layout of information on screen and on the understandability of website content. Participants then completed the remaining four scenarios and were interviewed about the two additional websites. Finally, participants were asked to indicate which of the four websites was their preferred website and why, and to describe an ideal website for locating medication information (see Appendix 11).

RESULTS

Table 5.3 shows a summary of the main measures obtained during user testing.

Table 5.3 Main results from user testing

	HD	**NPS**	**MyDr**	**BHC**
Average time taken to complete a scenario (range)	2 min, 35 s (15 s – 13 min, 26 s)	1 min, 47 s (16 s – 7 min, 1 s)	1 min, 48 s (20 s – 5 min, 34 s)	2 min, 32 s (27 s – 6 min, 28 s)
Average number of screens viewed (range)	5.7 (1 – 28)	3.5* (1 – 14)	3.9 (1 – 12)	5.2 (2 – 13)

Average number of new searches (range)	1.2 (0 – 6)	0.7 (0 – 4)	1.0 (0 – 5)	1.3 (0 – 5)
Percentage correct	84%	89%	91%	84%

HD = Healthdirect website, NPS = National Prescribing Service website, BHC = Better Health Channel website; *significantly fewer screens than HD

As shown in the table, users appeared to be faster at locating information, viewed fewer screens and appeared to be more accurate when using the NPS and MyDr websites compared to the Healthdirect and Better Health Channel websites. When we compared Healthdirect search times to each of the other websites, no significant differences were found ($p>0.05$). In the same way, no significant differences in accuracy were found between websites, but users did have to view a greater number of screens to locate information on the Healthdirect website compared to the NPS website ($p=0.03$). The differences between websites, although not large, did influence user perceptions of the sites. Eleven of the 16 participants (69%) indicated that NPS was their preferred website, four participants (25%) said MyDr, and one participant preferred Healthdirect to the other websites.

Users of Healthdirect's website were directed to external sites for the majority (81%) of scenarios. Participants located the information on the MyDr websites in 13 cases, and on the NPS website in 11 cases.

Overall, it appeared to be more difficult for participants to locate the appropriate page of information for each scenario than to find the relevant piece of information on a page. Most participants were observed to begin each scenario by entering a keyword(s) into the homepage search box. A small number of participants looked for the website's medicine page before searching for a particular medication name. When trying to locate a piece of information on a webpage, more than half the participants (n=10) used a keyboard shortcut (i.e. control-F) to find a keyword (e.g. pregnancy) on the page, while the remaining participants scrolled through the information.

Several usability issues were identified by the researcher during observations. These were discussed with participants during interviews, as were additional problems that users had identified while completing the scenarios. Table 5.4 lists the main website

features that hindered or facilitated finding medication information and a quote from a participant to demonstrate each point.

Table 5.4 Good and bad website features identified during user testing

Website features that hindered finding medication information	**Participant quote**
Entering keyword combinations (e.g. Panadeine Forte *and* breastfeeding) into search boxes did not bring up relevant results – users had to search by a single keyword	*Yeah, so if it would work more like Google where I would type in the keywords of what I was looking for then that would be much easier. That was something that I noticed all the websites didn't do (P1)*
Slow loading times and error messages ('URL does not exist') - this was only a problem for BHC	No participant mentioned this during interviews, but most users were observed to express frustration and annoyance when these problems were encountered during the trial
Presenting medication information in a separate location from health information. Users generally viewed medication information as a subset of health information, not as a separate category of information	*I think it should be more integrated because I think that that's logically how people think. They see health as being the generic term and medicine a subset within. (P11)*
A large number of results being generated from search-box queries	*It's like when you're searching, it kind of gives you every possible result rather than the one you probably want, the common one. Well, I don't know, I mean, it's hard to get that balance between only throwing up a few common ones, and the person could miss out on what they want to see, or throwing up everything and the person just gets, like, what is all this? (P16)*

The website directing users to a PDF version of the consumer medicine information	*It's really wordy and the format of it, because it's set up, to me, its set up like a physical pamphlet, so if I had that in my hands, that's fine but on the screen, the three column thing with the same format and the font of a physical pamphlet doesn't work ... it makes skimming much harder because, I mean, I could do it but it just took me longer (P4)*
A large number of menus and drop-down menus on the homepage resulted in participants using the search box, rather than browsing the website	*Yeah, so it's very all over the place really. You really don't know where to start with that one so you're almost forced to go to search this side (P10)*
Listing medications only by generic names or brand names, not both	*It can be confusing with generic versus brand names, because I know one, when that I was initially looking for Zoloft I looked at that list of anti-depressants and I think they only had the generic names so I didn't see Zoloft on that list, so I think it's important to have both written (P3)*
Website features that facilitated finding medication information	**Participant quote**
Including subheadings on each webpage	*Subheadings are very good. Especially when you know what you are looking for (P1)*
Uncluttered pages with not too much information displayed	*I think the layout is really important like how much stuff's on the actual page. Is there a lot of writing versus are there just a few things like one box that says like 'search here,' 'this is the list of the medications,' I think that's easier to navigate in terms of like finding what you're looking for (P3)*

Auto-completion of search terms in search boxes	*I like that if you search something there are suggestions for what you are searching (P6)*
Displaying information in bullet point format instead of paragraphs of text	*Bullet points are good. I mean, you don't want massive slabs of information that you need to search through (P5)*
Using highlight techniques to break up text and to indicate what sections of text are important	*I think that in terms of NPS there was more bold so I found it easier to read because then I would just skim and if the bold didn't apply then I would just ignore the regular font (P4)*
Subheadings listed at the start of a page so that users could click on a heading and it would direct them to the appropriate section of text on the page	*You don't want to sit there reading through it all. Having those little jumping links is helpful if you are looking for a particular bit of information (P15)*

All participants reported that information displayed on websites was presented at the right level of difficultly, although some suggested that content was understandable because they were students or researchers. One participant said *"I think there would be a not insignificant proportion of the population that would struggle with it, because they would baulk at the terminology that's used". (P11)*

User opinions of Healthdirect's website

When asked specifically about the Healthdirect website, participants were generally confused about it directing them to external sources for information. One participant said "*I thought it was also a little strange because it was taking me off the website so for example one of them, I ended on MyDr … so it just felt weird, why would I use that website, why wouldn't I just use the other one if it's taking me to the other one?" (P4).*

When it was explained to users that Healthdirect's website acted like more of a directory, providing consumers with a list of the most relevant websites for locating a piece of information, participants had mixed views about this. Some were receptive to

the idea: "*I think that's fine if there's a, you know, rather than having multiple sources of information, I think if there's a link between an accepted or respected source of that information, why repeat it. (P11).* Others did not like it: "*Hesitant. Like they (Healthdirect) were inadequate to provide it. So I like a single source of truth" (P13).*

Overall, users had limited time to experience the Healthdirect site during the trial (because they were immediately directed to external sites for information). However, Healthdirect's pages were generally well-liked. One participant said: "*The Healthdirect site was bigger so there seemed to be more modular, so it was clear that this, you know, on the left panel that was one section, the middle panel was one section and the right was another section and I knew that most - and it was clear that the most important things for me were right in the middle". (P14)*

SUMMARY OF FINDINGS

Healthdirect's strategy of directing consumers to external websites for medication information resulted in users taking on average 40 seconds longer and viewing on average two more screens than when searching for medication information on the NPS website. Overall, users preferred the NPS website to other sites because search results were highly relevant, and subheadings and bolding made information easy to locate on a page. Better Health Channel was viewed as the most difficult website to use because its home page contained a large number of menus (in very small font), search results were often irrelevant, loading times were long and several URLs could not be found. The Healthdirect user interface was well liked, but users had mixed views about the website directing them to other sources for information.

STRATEGIES FOR IMPROVING HEALTHDIRECT'S CURRENT TELEPHONE SERVICES

Based on our discussions with stakeholders, Healthdirect appears to be a comprehensive and accessible avenue for consumers to obtain medication information. Following on from issues raised by stakeholders in Study 1, we wish to highlight that CMIs may not contain the most suitable information for all consumer types phoning Healthdirect. It may be beneficial for nurses to be made aware of the limitations of CMI content and where appropriate, discuss these limitations with consumers.

Based on our detailed review of medication-related queries, we make the following recommendations:

1. Healthdirect should consider classifying medication-related queries into well-defined categories and automatically assigning medication names to drug classes. Ideally, medication names should be entered/captured as separate data fields. This would facilitate the identification of common problems and related medications for calls received, and would also enable the identification of service usage patterns and the prediction of consumer needs in a timely and regular fashion.

2. Session end times for GP calls should be noted. This would allow the duration of calls to be calculated which may help in identifying the call types that are most time-consuming.

3. Consistent session IDs should be used across different databases, especially for the nurse triage dataset and the GP after hours helpline dataset.

4. To reduce data entry errors and improve consistency within and across datasets, cross checking rules could be enforced. For example, if the caller age is too young, (i.e. under 6 years old), nurses (and doctors) could be prompted to double check the caller age; if a patient's age is not consistent with the medication guideline (adult or pediatric) being used, nurses (and doctors) could be alerted about this.

5. The list of caller-patient relationships should be revised so that they are mutually exclusive. They appear repetitive and currently overlap. For example, there are

categories for ‘Parent’ and ‘Father/Mother.’ New categories could be created, such as ‘Guardian,’ then subcategories such as ‘Parent; Carer; Step-parent.’

6. The list of caller questions should be revised so that it is more detailed. This would allow a more thorough analysis of the reasons for calls. For example, categories relating to medication interactions, breastfeeding, pregnancy, cold and flu, and pain relief could be considered.

7. A standardised approach for recording whether any technical difficulties were encountered, and the nature of the difficulty, could also help in the identification and resolution of common problems.

8. The accessibility and usability of decision support tools for GPs should be investigated, as these may be factors impeding use.

9. The automatic assignment of patients to a pre-defined age group would streamline this process and allow a more in-depth analysis of caller trends.

10. The findings from our analysis of the most frequently accessed fact sheets for different age groups could be used to improve the accessibility of fact sheets in the CeCC environment (e.g. placing the most frequently used factsheets in a location which is easy to see).

11. Healthdirect should consider the collection of more detailed data on the exact questions asked by callers and on the sections of fact sheets that are most frequently used. Collecting these data would make it possible for Healthdirect to optimise the content of its fact sheets (in terms of relevance and presentation).

RECOMMENDATIONS FOR THE CeCC SYSTEM AND MEDICATION GUIDELINES

Our multi-method investigation of the CeCC system and the associated triage process uncovered a number of usability issues and potential areas of improvement. Modifying system elements, as described below, may improve efficiency and accuracy of patient documentation, triage, the provision of information and referrals.

Overall Recommendations (Applicable to all Tasks):

12. The search features and the free-text fields in the CeCC interface do not have spell-check currently enabled. A basic spellchecker and auto-correct feature can minimise typing errors and expedite the data entry process.
    a. A contextual spell checker may not be achievable at this stage however in the long term a spell checker and auto correct catering for commonly used abbreviations and medication names (by linking with appropriate databases like MIMS) could improve the user experience and data accuracy.
13. The look and feel of the data entry interface of CeCC needs to be improved in terms of font size, visual cues and optimal use of the screen space. The headings/labels need to be differentiated from other fields on the screen. This can be achieved by utilising highlighting techniques, for example, consistently formatting headings in bold and changing the font colour.
14. Abbreviations used in the CeCC system need to be appropriately expanded at least once. This is especially important for novice users.
15. The redundant information (e.g. navigational information ("transfer too…") in the medication guidelines, version and reviewer name in the fact sheets) and related widgets (e.g. "Person Overview" section) in the CeCC should be removed from the interface. This will improve the visual quality and readability of the interface.
16. For all search based functions supported by CeCC (e.g. searching fact sheets, searching referrals, searching guidelines) the results retrieved need to be consistently presented in a well-defined order. This may be achieved by presenting the results in order of relevance, however the user should be given clear options to sort results by other possible parameters e.g. alphabetical, by distance from location (for referral results).
17. The input methods for comparable tasks throughout the CeCC system should be consistent.

Specific Recommendations:

Searching for the client record

18. The search function needs to have appropriate filters and search parameters to enable nurses to promptly select the correct record for a caller. If possible, assigning callers a standard identifier (e.g. a combination of date of birth and name initials) to drive the search client function will allow nurses to sift through only relevant records and eliminate the creation of duplicate records for the same client.

19. The visibility of the "+" sign indicating that the particular caller has other clients attached to their record could be improved by, for example, changing the colour of the sign. Furthermore, an information call out could be attached to the sign (which is visible when the user moves their curser to the sign) to indicate the purpose of the sign to the user. The nested relationship between callers and patients should also be cross-checked to ensure that they are bi-directional (i.e. searching for the child should retrieve the parent node and vice versa).

Assessment Documentation

20. The free text descriptions users input into the primary fields in the medication assessment section, are not only time consuming in terms of data entry but also limit consistency of the entered data and any possible analysis. To improve the information design of the information entered in these fields, Healthdirect could consider mapping these narrative fields to controlled vocabularies. Mapping of narrative fields to a standard back-end data base (e.g. MIMS) will facilitate consistent capturing of medication names and also enable auto-assignment of medication classes (e.g. analgesics, antipsychotics etc.). A combination of structured and narrative free text for describing the initial assessment is recommended to improve the quality of captured information.[9, 10] That is, the "Primary Assessment" field can be structured and selected from a drop down list, and this can be followed by a free narrative description of the problem as described by the caller.

21. To further improve alignment of the CeCC interface with the triage process, appropriate contextual filters could be implemented. A primary example of this

would be filtering out any redundant questions from the selected guideline based on a patient's gender.

Using the Guideline

22. The goal driven and linear process dictated by the medication guidelines (i.e. moving from A to B) does not align with the fast-paced work and quick responses required by nurses managing telephone queries.[11, 12] Ideally, the CeCC system should adapt to scenarios as they unfold, where a nurse may not need to scroll through all possible options to reach the appropriate disposition. Navigational issues (entering web based information sources, accessing a recommended guideline, scanning through "links", accessing fact sheets, documenting caller refusal to comply, confirming delivery of care advice, etc) currently limit optimal use of the CeCC system and hinder process efficiency. Recommendations to improve the navigation and flexibility of system usage include:

    b. Providing shortcuts throughout the guideline questions. This may include options to auto-skip questions, based on the context of a call. For simple information queries a quick 'information only' option can be provided to eliminate unnecessary navigation through the entire guideline.

    c. Providing shortcuts to commonly used information sources, embedded hyperlinks within the guideline and auto capture for common resources accessed by nurses on-line (e.g. eMIMS). The system could automatically capture the name of the resource accessed and its associated hyperlink. This will eliminate the requirement for nurses to manually enter hyperlinks into the web based information section. Embedding reference sources as quick hyperlinks (both in the main guideline interface and as a menu item in the navigation tree) may encourage nurses to access the decision support tools from within the CeCC system, rather than externally.

    d. Improving the fact sheet content for interactivity. Hyperlinks for redirecting users to other fact/tip sheets (e.g. accessing ibuprofen from paracetamol tip sheet) would be helpful.

e. Directing nurses to the suggested guideline upon nurses accepting the suggestion to use an alternative guideline. This would reduce the number of screen turn overs required for navigation, therefore reducing the time taken to access the required guideline.

f. Providing quick links to the top ten most accessed factsheets on the guideline interface (e.g. the right side of the search window). This would expedite the process of accessing medication-related fact sheets.

Information exchange with the client

23. When exchanging information with the caller (e.g. referrals and simple medication information), the CeCC system only allows verbal exchange of information. This could be enhanced by providing additional avenues for delivery of information (e.g. email, text message).

STRATEGIES FOR IMPROVING HEALTHDIRECT'S CURRENT DIGITAL SERVICES

The following recommendations follow on from issues raised by stakeholders in Study 1:

1. The number of search results that are outputted from search-box queries on Healthdirect's website should be limited to only those that are directly relevant to the query.
2. Search results should be ordered in terms of relevance and the most relevant search results for the user should be clearly marked (e.g. use highlighting techniques).
3. Information content of Healthdirect's website should be understandable to consumers with very limited knowledge of health/medicines.
4. Accessibility of Healthdirect's medication services could be improved by developing well-defined interactive mobile applications that offer a personalised experience for consumers.

In addition to providing consumers with specific medication information, Healthdirect's digital services present another avenue for educating consumers on how to approach or understand medication information. For example, Healthdirect could provide easy-to-understand, evidence-based information on the limitations of CMI and how to interpret information contained in CMI leaflets.

Based on our gap analysis, user testing and feedback from users we recommend Healthdirect consider making the following changes to its website:

Improvements to the search functionality

5. Improve the home-page search function so that searching by multiple keywords is possible
6. Limit the number of search results that are outputted from a search-box query to only those that are directly relevant to the query (e.g. inputting the word 'antibiotics' currently brings up 855 search results)

7. Sort search-box results in order of relevance and make clear what the most relevant search results are for the user (e.g. use highlighting techniques)
8. Allow searching by both brand names and generic drug names

Improvements to the layout of information on webpages

9. Include hyperlinked subheadings at the top of webpages to improve user navigation within a page
10. Use highlighting techniques to direct user attention to important information
11. Use bullet points where possible and limit the use of long paragraphs of text

Addition of content

12. The Healthdirect website's propensity to refer consumers to other external websites for information provides consumers with a wide range of medication information, more information than any other single website we assessed. Despite this, we suggest Healthdirect consider expanding its own medication content, to include:
    a. More comprehensive information on common analgesics (paracetamol, ibuprofen, paracetamol and codeine)
    b. More information related to common queries on the website's antibiotics and antidepressants pages
    c. A general information page on antihistamines
    d. A general information page on anticoagulants/antithrombotics
    e. A general information page on complementary medicines

Healthdirect's referral process

Based on users' confusion about Healthdirect's referral process, we recommend that Healthdirect more clearly communicate (and market themselves) to consumers as a directory service. For example, when search results are displayed, a heading could explain that the list displays *external* websites offering relevant information.

It is unlikely that users will return to the Healthdirect website for medication information if they are repeatedly directed to a small number of alternative websites for this information (i.e. NPS and MyDr). After multiple referrals, consumers are

likely to access the other websites directly. We recommend Healthdirect include more medication information on their website (see above).

APPROACH TO IMPLEMENTATION OF STRATEGIES

In implementing changes to Healthdirect's telephone and digital services, the adoption of a user-centred approach would be valuable. Consumer engagement in the development and evaluation of any structural and content changes made to the Healthdirect website will assist in ensuring services meet the needs of this target audience. Involving users early on in the development process (e.g. recruitment of consumers to assist with development of the new website thesaurus/information model) would provide Healthdirect with feedback about whether website content aligns with consumer approaches to searching and retrieving medication-related information. Similarly, user testing with a diverse range of consumers prior to finalising website changes will assist in the identification of any additional usability issues.

In modifying the nurse triage medication guidelines, continuous input from current telephone providers, both in the development of new guidelines and processes, and in the evaluation of new guidelines once developed, will provide valuable insights. In particular, involving both less experienced nurses and highly experienced nurses in the development process would be beneficial.

REFERENCES

1. Ko, Y., et al., *BRIEF REPORT: Development of a Prescription Medication Information Webliography for Consumers.* Journal of General Internal Medicine, 2006. **21**(12): p. 1313-1316.
2. Peterson, G., P. Aslani, and K.A. Williams, *How do consumers search for and appraise information on medicines on the Internet? A qualitative study using focus groups.* Journal of medical Internet research, 2003. **5**(4): p. e33.
3. Healthdirect Australia, *Heatlhdirect Australia Biannual Report January-June 2014*. 2014.
4. *Top 10 drugs.* Australian Prescriber, 2013. **36**: p. 211.
5. Morgan, T.K., et al., *A national census of medicines use: a 24-hour snapshot of Australians aged 50 years and older.* Med J Aust, 2012. **196**(1): p. 50-3.
6. Aslani, P., et al., *Investigating Consumer Medicine Information (I-CMI) Project.* Australian Government Department of Health and Ageing; The Pharmacy Guild of Australia.
7. MacLennan, A.H., S.P. Myers, and A.W. Taylor, *The continuing use of complementary and alternative medicine in South Australia: costs and beliefs in 2004.* Med J Aust, 2006. **184**(1): p. 27-31.
8. Xue, C.C., et al., *Complementary and alternative medicine use in Australia: a national population-based survey.* J Altern Complement Med, 2007. **13**(6): p. 643-50.
9. Sweet, L.E. and H.L. Moulaison, *Electronic Health Records Data and Metadata: Challenges for Big Data in the United States.* Big Data, 2013. **1**(4): p. 245-251.
10. Hardiker, N.R. and S. Bakken, *Requirements of tools and techniques to support the entry of structured nursing data.* 2004.
11. Ernesäter, A., I. Holmström, and M. Engström, *Telenurses' experiences of working with computerized decision support: supporting, inhibiting and quality improving.* Journal of advanced nursing, 2009. **65**(5): p. 1074-1083.
12. Hall, S.A., et al. *Benefits Realized through Usability Analysis of a Tele-nursing Call Management Software System at HealthLink BC*. in *NI 2012: Proceedings of the 11th International Congress on Nursing Informatics*. 2012. American Medical Informatics Association.
13. Nielson, J. and R. Mack, eds. *Usability inspection methods*. 1994, Wiley: New York.

APPENDICES

Appendix 1. Semi-structured interview questions for stakeholders (Study 1)

1. How many queries related to medications do you receive per day/week?
2. How are these queries received? I.e. over the phone, via email, etc?
3. What are the most common medications you are asked about?
4. What are the most common questions you get asked about these medications?
5. Can you describe the types of consumers who frequently make enquiries? (e.g. mothers asking about their children's medications?)
6. When providing medication-related advice or information, what resources do you use? (e.g. websites) Do you follow a guideline?
7. Do you direct consumers to any other sources for obtaining medication information?
8. What do you think are the best resources available for consumers to obtain medication information? What makes these resources effective?

Appendix 2. List of Medication Information Sheets – Healthdirect Australia (Study 2)

Healthdirect Australia Medicine Info
Acetylsalicylic Acid
Amphetamine Medications
Antacids
Antibiotics - Ciprofloxacin
Antibiotics - Erythromycin
Antibiotics - How to use them wisely
Antibiotics - Rifampicin
Anusol
Benzocaine topical anaesthetic cream/spray
Calamine Lotion
Cetrimide
Chlorexylenol
Crotamiton [Aust]
Diclofenac - Topical
Dimenhydrinate
Diphenoxylate
Docusate sodium - Laxative
Docusate Sodium Ear Drops
Emulsifying Ointment
Gastrolyte
Gaviscon Formulations

Gaviscon Infant Powder
Hypromellose
Ibuprofen suspension - children 3 months to 12 years
Ibuprofen tablets
Ichthammol Cream
Idoxuridine (Topical)
Karvol
Ketoconazole Shampoo
Medications and Breastfeeding
Medicines for your child
Miconazole nitrate - zinc oxide
Mylanta
Naphazoline
Naproxen sodium
Nurofen Tip Sheet
Oral Anaesthetics - Teething Gel
Oxymetazoline HCL Nasal Spray
Paracetamol - Dosing Guide
Paracetamol Tip Sheet
Penciclovir (Topical)
Permethrin topical
Phenylephrine HCL
Pholcodine

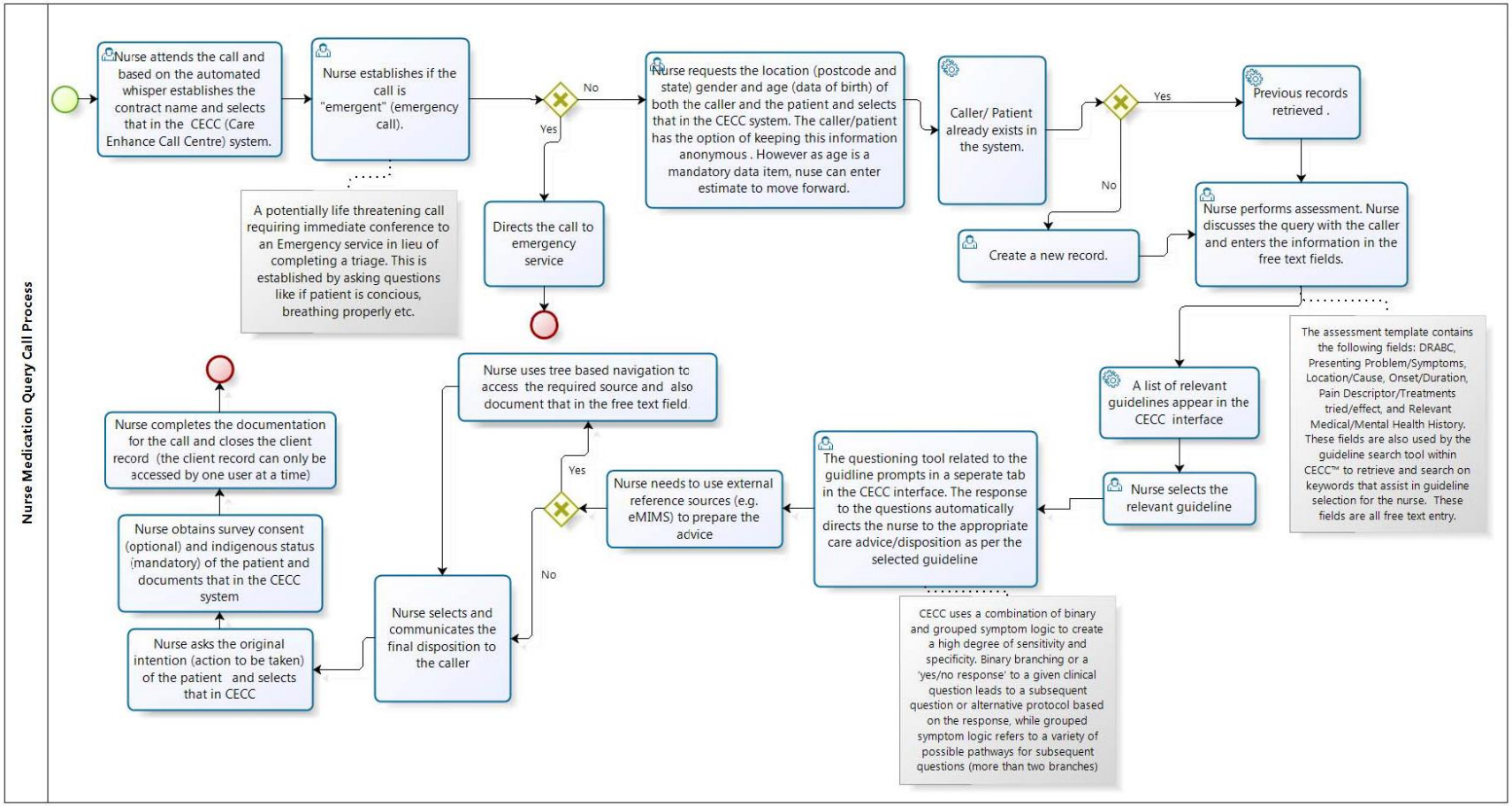
Pine tar
Podophyllin
Polyvinyl alcohol
Povidone iodine
Psyllium hydrophyllic - Mucilloid
Rehydration solutions - Oral
Salicylic acid wart remover
Saline nasal spray
Simethicone
Soft white paraffin
Soluble Lanolin
Soov Bite
Sorboline Cream (Cetomacrogol)
Standardised Senna
Steroids
Terbinafine HCL (Topical)
Tetrahydrozoline HCL
Tixylix
Tolnaftate (topical)
Vicks Vaporub
Vosol
Xylometazoline
Zinc oxide

Appendix 3. Heuristics adopted for CeCC review [13] (Study 3)

Heuristic	Description
Visibility of system status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
Match between system and the real world	The system should speak the user's language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
User control and freedom (ease of navigation)	Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
Consistency and standards	Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
Error prevention	Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
Recognition rather than recall	Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
Flexibility and efficiency of use	Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
Help users recognize, diagnose, and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution
Help and documentation	Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Appendix 4. Workflow model of query handling process (Study 3)



Appendix 5. Severity scale [13] used for CeCC review (Study 3)

0 Not a usability problem at all;

1 Cosmetic problem only. Need not be fixed unless extra time is available;

2 Minor usability problem. Fixing this should be given low priority;

3 Major usability problem. Important to fix. Should be given high priority;

4 Usability catastrophe. Imperative to fix this before product can be released.

Appendix 6. Semi-structured interview questions for telephone providers (Study 3)

1. Do you receive many queries from consumers related to medications? Can you estimate the rate at which these are received (e.g. 10 per day?)
2. What are the most common medications you are asked about?
3. What are the most common questions you get asked about these medications?
4. Can you describe the types of consumers who frequently make enquiries? (e.g. mothers asking about their children's medications?)
5. When providing medication-related advice or information, what resources do you use? (e.g. websites)
6. Do you find your guideline for telephone calls easy to use? What do you like/not like about it? Can you think of any ways the guideline could be improved?
7. Do you feel confident when giving medication-related advice? Why/why not?
8. Can you think of anything that would make it easier or quicker for you to give medication-related advice over the phone?
9. Can you think of anything that would improve the quality of the advice you provide?
10. Do you direct consumers to any other sources for obtaining medication information?
11. What do you think are the best resources available for consumers to obtain medication information? What makes these resources effective?

Appendix 7: The most common medication classes and top 3 queries from triage medication calls received by Healthdirect in November 2014 (Study 4)

Most common medication class and related queries	**No. of times asked***
SIMPLE ANALGESICS AND ANTIPYRETICS *(paracetamol, ibuprofen, paracetamol & codeine)*	**180**
Interactions	30
Appropriate dose for babies/children?	26
I have exceeded the recommended dose	12
ANTIBIOTICS *(Most commonly: amoxycillin)*	**74**
Interactions	20
I don't think I need it anymore, can I stop taking it?	5
Missed dose	5
ANTIDEPRESSANTS *(Most commonly: sertraline)*	**42**
Interactions	12
Starting and stopping medication	9
Missed dose	8
ANTIHISTAMINES *(Most commonly: promethazine)*	**37**
Interactions	16
Can I give it to a child?	4
Is it safe to take while breastfeeding?	3
ANTICOAGULANTS, ANTITHROMBOTICS *(Most commonly: warfarin)*	**18**

Interactions	6
Side effects?	2

*Frequencies of queries do not add up to total no. of calls regarding a medication class since only the top 3 queries are given.

Appendix 8: Fact sheets used by nurses in information medication calls received by Healthdirect in November 2014 (Study 4)

Healthdirect medication fact sheet	No. of calls
Paracetamol Tip Sheet	131
Nurofen Tip Sheet	105
Paracetamol - Dosing Guide	56
Ibuprofen suspension - children 3 months to 12 years	18
Ibuprofen tablets	13
Rehydration solutions - Oral	8
Gastrolyte	7
Antibiotics - How to use them wisely	6
Anusol	3
Gaviscon Infant Powder	3
Medications and Breastfeeding	3
Saline nasal spray	3
Docusate sodium - Laxative	2
Medicines for your child	2
Soluble Lanolin	2
Tolnaftate (topical)	2
Zinc oxide	2
Antacids	1
Antibiotics - Erythromycin	1
Ichthammol Cream	1

Miconazole nitrate - zinc oxide	1
Mylanta	1
Naproxen sodium	1
Oral Anaesthetics - Teething Gel	1
Pine tar	1
Povidone iodine	1
Psyllium hydrophyllic - Mucilloid	1
Simethicone	1
Standardised Senna	1
Vicks Vaporub	1
Total	**379**

Appendix 9: Top 10 prescription* medications for July 2012-June 2013 (Study 4)

Top 10 by DDD/1000 pop/day	Top 10 by prescription count
1. Atorvastatin	1. Atorvastatin
2. Rosuvastatin	2. Rosuvastatin
3. Perindopril	3. Esomeprazole
4. Paracetamol	4. Paracetamol
5. Irbesartan	5. Pantoprazole
6. Candesartan	6. Perindopril
7. Amlodipine	7. Metformin hydrochloride
8. Ramipril	8. Simvastatin
9. Esomeprazole	9. Salmeterol and fluticasone
10. Simvastatin	10. Irbesartan

Source: Pharmaceutical Benefits Scheme (PBS) data reported by Australian Prescriber[4]

DDD/1000 pop/day is defined daily dose per thousand population per day.

*Includes only prescriptions supplied under the PBS; does not include private prescriptions and prescriptions under the PBS co-payment.

Appendix 10. Top 10 most commonly used prescription and non-prescription medications among Australian medication users aged 50 years and older, 2009-10 (Study 4)

Top 10 in the last month	Top 10 in the last 24 hours
1. Paracetamol	1. Omega-3 marine triglycerides
2. Omega-3 marine triglycerides	2. Paracetamol
3. Aspirin	3. Aspirin
4. Glucosamine	4. Glucosamine
5. Atorvastatin	5. Atorvastatin
6. Calcium	6. Calcium
7. Cholecalciferol	7. Cholecalciferol
8. Ascorbic acid	8. Irbesartan
9. Irbesartan	9. Hydrochlorothiazide
10. Hydrochlorothiazide	10. Ascorbic acid

Source: National Census of Medicines[5]

Appendix 11. Semi-structured interview questions for consumers (Study 5)

[Begin by collecting basic demographics: Age, gender, frequency of internet use, frequency of searching the internet for health/medication-related information]

After websites 1 & 2:

1. Of the 2 websites you used, which did you prefer? Why?
2. What features of the websites made finding medication information easy or difficult?
3. What did you think of the information on each website, once you found it? Was it easy to understand? Did the websites display information at the right level of difficulty (i.e. not too complex, not too simple).
4. In terms of the format of the information on screen, which of the 2 websites displayed the information in the best format? Why?

After websites 3 & 4

1. Of the 2 websites you used, which did you prefer? Why?
2. What features of the websites made finding medication information easy or difficult?
3. What did you think of the information on each website, once you found it? Was it easy to understand? Did the websites display information at the right level of difficulty (i.e. not too complex, not too simple).
4. In terms of the format of the information on screen, which of the 2 websites displayed the information in the best format? Why?

Overall:

1. What was your favourite website to use? Why?
2. What was your least favourite website to use? Why?
3. Can you think of any features or functions that a website should include to make finding information quick and easy?
4. What would be the best way to display medication information? (e.g. bullet points, flow charts etc)