The final (corrected) version of the paper is available in:
Journal of Nursing Management 27 (6), 1275-1284
https://onlinelibrary.wiley.com/doi/abs/10.1111/jonm.12809

Potential of a nurse telephone triage line to direct elderly to appropriate health care settings

Marta Jácome BSN, MSc, Nazaré Rego PhD, Paula Veiga PhD

Abstract

Aim: To explore the potential of a nurse health triage telephone line to advise and guide elderly users' decisions regarding the appropriate health care setting and self-care.

Background: Ageing is a concern in many countries and poses important challenges to health care services. Triage and advice lines can play an important role for the (re)organisation of health care delivery. Discussion has been focused on the capacity of these lines to reduce inappropriate demand for acute and emergency departments.

Methods: Cross-sectional descriptive analysis.

Results: Nurses directed elders to a health care service both by downgrading their initial intentions (concurring to the most common objective) and by upgrading them (e.g., directing elders that intended to stay at home to acute and emergency care). The intention to comply with the nurse's disposition was high.

Conclusions: The line helped to improve the appropriateness of acute and emergency care demand and to reduce the overall demand for care by elders. There is nonetheless space for improvement given the underuse of the line by elders.

Implications for Nursing Management: Health telephone-based triage and advice should be promoted to increase the match between the needs of elderly patients and health resources thus improving health equity.

Keywords: telephone nurse triage, telephone hotlines, ageing, older people, Portugal

Background

An ageing population is one of the policy concerns in Portugal as the country has one of the fastest ageing populations in the European Union. The proportion of people aged 65 or more years is expected to increase from 19.6%, in 2013, to 26.8%, in 2030 (European Commission, 2015). Moreover, the proportion of individuals aged "80 years and over" (the oldest old) in the total elderly population is expected to rise from 27.7%, in 2013, to 30.3%, in 2030 (European Commission, 2015). Elderly Portuguese have a high prevalence of chronic diseases and disability, high demand for health care, and low income (Correia, Ferreira, Pinto, Valente, & Veiga, 2017). They are also disproportionally concentrated in rural and unserved areas (Santana, 2000) and more likely to have limited health literacy (Paiva et al., 2017).

The health care system faces huge challenges in providing adequate, efficient, accessible, and equitable services for the ageing population. A visible struggle is the overcrowding of hospital's acute and emergency departments (A&E). Inappropriate A&E admissions represent 30% of the total (calculations based on official data of Ministério da Saúde, 2017a). Elderly are not the age group that uses A&E the most inappropriately (Gomes, 2014; Pereira et al., 2001). Nonetheless, they are likely to face higher risks from resorting to an inappropriate level of care, for example, due to frailty or complex health status (e.g., in consequence of multimorbidity).

Health triage and advice lines (e.g., the *NHS Direct* in the UK, *healthdirect* in Australia, *Linha Saúde 24* in Portugal, etc.) can play an important role for the necessary (re)organisation of health care delivery and the improvement of health equity. There is cumulative evidence that they can promote safe, efficient, and equitable health care for the elderly, in particular those living in unserved areas, by advising and directing them to services that best suit their health symptoms (Bogdan, Green, Swanson, Gabow, & Dart, 2004; Cariello, 2003; Delichatsios, Callahan, & Charlson, 1998; Hogenbirk, Pong, & Lemieux, 2005; Lattimer et al., 2000;

Navratil-Strawn et al., 2014; Oliveira, 2010; Simão, 2009; Soares, Aidos, Rodrigues, & Guimarães, 2006; Van den Heede & Van de Voorde, 2016). This guidance reduces inappropriate A&E care, and encourages better self-care (Dahlgren et al., 2017; Hsu, Bath, Large, & Williams, 2011; Jácome, 2016; Simão, 2009). A better match between needs of patients and the health care settings, and adequate self-care can lead to a more efficient use of health care resources and contribute to reduce costs (Bogdan et al., 2004; Lambert, Fordham, Large, & Gaffney, 2013; Lattimer et al., 2000; Marklund et al., 2007; Navratil-Strawn et al., 2014). Nonetheless, interactional factors may impact the performance of health advice lines (Lake et al., 2017; Tran et al., 2017).

In Portugal, *Linha Saúde 24* (hereafter, S24) was launched in 2007. At the time of data collection, it was a public-private partnership integrated into the National Health Service (NHS). S24 provides registered nurse-led 24-hour/7 days screening, counselling and referral services, mainly via telephone. The National Health Plan recognises S24 as an instrument to increase NHS effectiveness and to improve access and equity in health (Direção-Geral da Saúde, 2012). However, there is still limited knowledge about the use and impact of the line, in particular among the older population. Elders underuse the service, accounting for a small share of total S24 calls (Oliveira, 2010; Simão, 2009). This low uptake contrasts with their use of other health care services, but is consistent with findings from international studies (David, 2005; Hsu et al., 2011). Moreover, educated and urban elders appear to be more likely to use S24 (Jácome, 2016; Oliveira, 2010; Simão, 2009).

Insights about characteristics of the calls and the impact of nurse advice and triage on elderly health care decisions could help to design policies to improve S24 and the coordination with other health services. The results are of particular importance due to the ongoing debate about designing incentives to promote appropriate access to S24. Also to inform the reactivation of a dedicated health line service for the elderly or, at least, some of its features. (This service was

launched in April 2014 and then temporarily closed in 2016.) Thus, the aim of this research is to explore the potential of S24 to advise and guide elderly users' decisions regarding the appropriate health care setting and self-care.

Methods

Design

A cross-sectional descriptive study was conducted because the dataset analysed included (almost) all recorded calls made by (or on behalf of) elders during the period considered.

The study was conceived by all the authors. The first author collected the data and carried out exploratory literature review and data analysis. The second and the third authors performed the final data analysis and wrote the manuscript. All authors discussed the results and contributed to the final manuscript.

Data collection

Data came from S24 administration system. It was routinely collected by the nurses in charge, following an internal protocol. Data included user's age, sex, district of residence, self-reported health symptoms, day and hour of the call, nurse's disposition and user's initial and final (further actions) intentions. Nurse's disposition (or referral) is a directive from the nurse in charge to the user about the time, place, and type of health professional (if applicable) by whom the elder's symptoms are to be further evaluated and/or treated (Wheeler, Greenberg, Mahlmeister, & Wolfe, 2015). S24 nurse's disposition is based on clinical algorithms with the support of a computer system and is labelled according to a predetermined triage category. After the nurse's disposition, users are asked "what they would have done if they had not called S24" and "what they intend to do after". In the data obtained from the S24 computer system,

these “initial” and “final” intentions were labelled using categories that were identical to those used for dispositions.

Anonymised 148,099 episodes, comprising information on all recorded telephone calls by elderly (or on their behalf) between April 2013 and March 2015, were retrieved. They represented 13% of total S24 calls during the period. Table 1 summarises the determination of the final dataset. Calls considered inappropriate, out of S24 scope, without clear nurses’ dispositions, or from users who refused the triage were excluded. The final dataset included 147,725 episodes. 120,269 of these had full information about the self-reported initial and final intentions of the user.

[Table 1, here]

Data analysis

The analysis of the data involved three steps: i) data classification; ii) data aggregation and comparison (through the construction of tables and charts); and iii) interpretation of the results. In the initial database, patient’s health concerns and symptoms were classified in 106 categories. The categories were then grouped in the following 21 standardised categories according to the Medical Subject Headings (U.S. National Library of Medicine, 2015): body temperature changes; dental problems; diabetes mellitus; digestive problems; diseases of the skin, hair and nails; disturbance of sensations; fatigue; hearth disorders; immune system diseases; medication; muscular diseases; nervous system diseases; nodules; non-traumatic fall; pain; poisoning and overdose; respiratory tract disorders; sleep problems; urogenital disorders; wounds and injuries; and other.

The disposition and intentions categories observed in the initial database were pooled into four groups according to the level (intensity) and urgency of care:

i) self-care at home (for the initial database category "self-care at home");

ii) non-urgent care (for the initial database categories "see a general practitioner (GP) in 1-3 days", "see a GP in 1 week", and "talk to a health professional");

iii) urgent GP care (for the categories "see a GP in 1-4 hours", and "see a GP in 12 hours"); and

iv) A&E care (for the categories, "call an ambulance", "go to an A&E department", and "redirected to the poisoning line").

The level of concordance between the users' intentions and the nurses' dispositions was measured as the proportion of exact agreement between them considering the four grouped intention and disposition categories just described (i.e., there was concordance if the group of the intention was the same as the group of the disposition).

Day and time of the call were pooled in two groups: "working hours", and "out-of-hours". Out-of-hours was defined as the period outside the normal opening hours of primary care units, i.e., between 8 p.m. and 8 a.m., Monday to Friday, and during the weekends. Data was also split into two age groups: "65-79 years" and "80 years and over".

Data classification and subsequent analyses were performed using IBM® SPSS®. Excel® and SankeyMATIC® were used to build the charts.

Ethical considerations

The study was approved by the Board of Directors of the Health Care Line and the Directorate - General of Health on March 15, 2016, complying with the ethical requirements of these entities. The data was received from the Health Care Line anonymised and was analysed in an aggregated way.

Results

Characteristics of the episodes

The majority of users were women (63% versus 37% men), younger than 80 years old (60.6% versus 39.4% aged 80 and over). The mean age was 77.3 years (Min: 65; Max: 117). Approximately half (51%) of the calls were received during the out-of-hours period, and 31% during the weekends.

The ten most frequent symptom standardised categories reported are shown in Fig. 1. Pain was the most common (18.1% of the calls), followed by respiratory tract disorders (11.9%), digestive problems (8.6%), diabetes mellitus (6.4%) and urogenital disorders (6.4%). Calls concerning at least one of these five symptom categories accounted for more than half of the total calls (51.3%).

[Fig. 1, here]

Urogenital disorders symptoms were more frequently reported by men (9.9% versus 4.3% of the calls by women) and the “oldest old” group (7.6% versus 5.6% of the calls by elders younger than 80). Pain and disturbance of senses were more frequently reported by the “65-79 age” group (19.8% and 5.9% versus 15.6% and 3.8% of the calls by the “oldest old”, respectively). There were no other relevant differences in the relative frequency of most common symptom categories worth to be noted.

Initial intention and nurse's disposition

Fig. 2 represents the users' initial intentions, the nurses' dispositions, and the final intentions of the callers. The flow chart highlights the role of the nurse mediating health care setting choice. Table 2 provides details on users' initial intentions versus nurses' dispositions. The majority of the users perceived the need for a high level of care (see the last column of Table 2): 58.2% intended to visit an A&E, and 9.1% intended to have an urgent appointment with a GP. On the other side, 9.6% intended to seek non-urgent care, and 23% to rely on self-care at home.

[Fig. 2, here]

[Table 2, here]

No substantial differences were noted between the initial intentions of users with different characteristics. Men (61% vs. 56% of the women), the "oldest old" (66% vs. 56% of the "younger than 80") and out-of-hours' users (60% vs. 57% of the users that called S24 during working-hours) intended to visit an A&E department slightly more. Men (21% vs. 24% of the women) and the "oldest old" (17% vs. 25% of the users in the "65-79 age" group) also intended slightly less to rely on self-care at home.

Most calls ended up in a recommendation to seek A&E care (42.4% of total calls), followed by urgent GP care (27.2%), non-urgent care (16.2%), and self-care at home (14.2%). Users in the "oldest old" group were more often referred to an A&E (51% vs. 40% of those in the "65-79 age" group) and less advised to rely on self-care (11% of the "oldest old" vs. 15% of the elders younger than 80). Nurses' dispositions were similar across user gender and time periods. The level of concordance between the users' initial intentions and the nurses' disposition was about 42.5%. The concordance varied across different dispositions (see the diagonal of Table

2). The nurses endorsed the original intention of 73.7% of the users advised to seek A&E care. Regarding the other levels of care, the concordance was much lower: 14.7% for urgent GP care, 19.2% for non-urgent care, and 37% for self-care. In one third of the calls (33.2%), nurses advised the users to seek a lower level of care than initially intended, and in 24.3%, a higher level of care. Concerning those who intended to seek A&E care (see first line of Table 2), 27.5% were advised to seek urgent GP care instead, 11.7% to seek non-urgent care, and 9.5% to self-care. Equally important, 28.2% of the users who intended to rely on self-care were advised to seek A&E care. Indeed, they represented 16.1% of total patients who were advised to receive A&E care.

Table 3 compares the concordance between the initial intention and the nurse's disposition by sex, age group, and time of the call. The overall concordance rate was slightly lower amongst female and the less old (65-79) users. In terms of the period of the call, the concordance was lower in out-of-hours periods, in particular when the nurse's disposition was to seek urgent GP care or non-urgent care.

[Table 3, here]

The concordance between user's initial intention and nurse's disposition greatly varied across the health symptom categories beyond the call (Fig. 1). Concordance rates were as low as 38.5% for respiratory tract disorders symptoms and higher than 50% for diabetes mellitus and urogenital disorders.

Fig. 3 depicts the relative importance of the various reported symptom categories in the users' initial intentions and in the nurses' dispositions by level of care. The initial intentions were broadly distributed within most of the symptoms examined. The symptoms reported by users intending to visit an A&E were more often pain (19% of total users intending to seek A&E

care), digestive problems (9%), respiratory tract disorders (8.5%), urogenital disorders (8%) and diabetes mellitus (7%).

[Fig. 3, here]

The five main reasons for contact that resulted in a recommendation to seek A&E care were pain (19.5% of the elders referred to A&E care by S24 nurses), diabetes mellitus (9.9%), urogenital disorders (8.4%), respiratory tract disorders (8.3%), and digestive problems (7.1%). Individuals presenting some symptoms (e.g., diabetes mellitus) appeared to devalue the urgency of their symptoms and were more often referred to A&E care than initially intended, while users with other (e.g., digestive problems) seemed to do the opposite. Similar discrepancies were observed in the other levels of care.

Fig. 4 presents a closer look on users with diabetes mellitus, urogenital disorders, respiratory tract disorders and digestive problems that illustrates the role that S24 can play on referring and advising patients to self-care at home. More than half the elderly patients with diabetes mellitus intending to rely on self-care at home were referred to A&E care. These patients represented 12% of all users with diabetes mellitus.

In terms of the users with symptoms of urogenital disorders, approximately 1 in 4 of those with the initial intention of seeking A&E care were advised by the nurses to visit a GP urgently. On the other hand, only approximately 1 in 10 of the users with urogenital disorders intending to rely on self-care at home were effectively advised to do so. The users directed from self-care at home to levels of care involving contact with a health professional represented 13% of all patients with urogenital disorders.

Both in the case of users reporting respiratory tract disorders or digestive problems, a high proportion of the callers presenting the symptom and the initial intention of seeking A&E care

(around 60% of those with respiratory tract disorders and 55% of those with digestive problems) were advised by the nurses to seek lower levels of care. These users represented 29% of those reporting respiratory tract disorders and one third of those reporting digestive problems.

[Fig. 4, here]

Intentions to comply

The impact of nurse's disposition depends on the compliance of users. The users' intention to comply was measured by the level of concordance between their final intentions and the nurses' dispositions. As presented in Fig. 2, intention to comply was high. Most users **(**85.6%) reported intention for subsequent actions coincided with the nurses' dispositions. Intentions to comply were higher for those referred to "self-care" (97.9% of the users' given that advice), followed by "non-urgent care" (90.4%), "A&E care" (89,1%), and "urgent GP care" (71.4%). Intention to comply was higher when the disposition confirmed the user's initial intention, but the majority of the users updated their initial intentions during the call. For example, 44.3% of the users who initially intended to seek A&E care reported the intention to use a lower level of intensity of care, and 59.4% of the users who initially intended to rely on self-care reported the intention to seek a higher level of care. Despite the high compliance intentions, 8.1% (4,816 users) of the elderly advised to visit A&E care and 9.8% (3,834 users) of those advised to seek GP care urgently still intended to rely on self-care at home. Of the 42,978 users who were given self-care and low-urgent care dispositions, only 6% reported no intention to comply.

Intentions to comply were similar between men and women. The oldest old users reported lower intention to comply when the recommendation lowered their initial intended level of care, when compared with their younger counterparts. For example, a higher proportion of the oldest group intended to seek "A&E care" after being advised to seek "urgent GP care" (17.9%

vs. 15.2% of the younger elders given the same advice). Out-of-hours users appeared, on average, less likely to comply. The proportion of these users intending to visit A&E care, after nurse recommendation to seek urgent GP care, was higher (19.5% vs. 12.1% of the elders who contacted S24 during working hours also advised to seek urgent GP care). The proportion of out-of-hours users intending to rely on home care after nurse advice to seek A&E care was also higher (9.4% vs. 6.7% of the elders that called S24 during working hours advised to seek A&E care). There were no relevant differences in the intention to comply attributable to the user's symptoms.

Discussion

We observed a low utilisation of the S24 line by Portuguese elderly, in particular amongst men and "oldest old" individuals. Pain, respiratory disorders, digestive problems, diabetes mellitus, and urogenital disorders were the most common reasons for calls. Diabetes accounted for more than 6% of the calls, reflecting the high prevalence of diabetes amongst elders in Portugal (Gardete-Correia et al., 2010). As expected, users with chronic diseases were more likely to anticipate the level of care needed.

It is particularly interesting to note that a large percentage of the calls were received out-of-hours, suggesting that users might use S24 as an alternative to primary care contact.

Most S24 calls were directed by the nurses to further medical care, which shows that the telephone line acted as gatekeeper to further health care. The appropriateness of the nurse's disposition was not evaluated in this study. Nonetheless, international studies suggest that, despite room for improvement (Huibers, Smits, Renaud, Giesen, & Wensing, 2011; Pasini, Rigon, & Vaona, 2015), health lines screening recommendations tend to be adequate and safe (Blank et al., 2012; Bunn, Byrne, & Kendall, 2004; Huibers et al., 2011; Marklund et al., 2007). Assuming nurses' dispositions were appropriate and safe, the results of this study indicate that

elders tend to overestimate the degree of severity of their symptoms, and nurses can adjust perceptions of the symptom's severity. Similar results were reported for the general Portuguese population (Botelho et al., 2019). The authors showed that the tendency to overestimate the degree of severity helps to explain the over demand for A&E care.

Considering the differences between initial intention and nurse's disposition, S24 had a potential of reduction of 34,091 inappropriate A&E visits by elders, less than 0.4% of the public hospitals general and psychiatric A&E visits (calculations based on official data of Ministério da Saúde, 2017b). This finding is consistent with international evidence that telephone triage and advice contributes to reduce the inappropriate use of A&E (Bogdan et al., 2004; Cariello, 2003; Delichatsios et al., 1998; Hogenbirk et al., 2005; Lattimer et al., 2000; Navratil-Strawn et al., 2014; Oliveira, 2010; Simão, 2009; Soares et al., 2006; Van den Heede & Van de Voorde, 2016), but also shows that there is still plenty of room for improvement in S24.

Health care literature and political discussion have been focused on the capacity of health triage and advice lines to safely reduce inappropriate demand for A&E care. Our results suggest that reductions in A&E demand should not necessarily be the main criterion to judge S24. Equally important, more than half of the elderly users seeking for "non-urgent" or "self-care at home" were advised to visit an A&E or a GP urgently, meaning additional 10,387 "appropriate" urgent A&E visits and 10,151 "appropriate" urgent GP appointments. Additionally, S24 supported a high number of users to self-manage their symptoms at home. The evidence suggests that, for conditions such as digestive problems and respiratory disorders, A&E care and urgent GP care can be substantially reduced through S24 adequate management.

User non-compliance may limit the impact of telephone triage and advice. In this study, the intentions to comply with nurse's disposition were slightly higher than the compliance rates and self-reported compliance rates that have been reported in related literature (Blank et al., 2012; Bogdan et al., 2004; Delichatsios et al., 1998; Foster, 2003; Hansen & Hunskaar, 2011;

Rimner, Blozik, Begley, Grandchamp, & Overbeck, 2011; Stewart, Fairhurst, Markland, & Marzouk, 2006; Tran et al., 2017). Moreover, contrary to Tran et al. (2017), compliance did not appear to vary substantially according to observable patient characteristics. However, the value of comparison is limited. The validity of intention to comply, as used in our study, has not been established in the literature. Notably, self-reported compliance tends to overestimate the true compliance (Blank et al., 2012; Bogdan et al., 2004).

Contrary to previous studies (Blank et al., 2012; Bogdan et al., 2004; Tran et al., 2017), patients self-reported slightly higher intention to comply with recommendations for the lowest care. The lowest rate of intention to comply with "urgent GP care" may have been a reflection of the unique challenges in accessing urgent primary care in Portugal (Correia, Norwood, Watson, & Veiga, 2014).

The relatively high number of patients who did not intend to comply with the recommendation to seek A&E care is a cause for concern. Further research should try to identify the characteristics and reasons of these users to help tailoring the several dimensions of S24 service to achieve optimal patient compliance.

Our study contributes to the ongoing debate about designing incentives to promote appropriate access to S24, in particular among elders. Since 2006, patients that are referred by S24 have exemption of users' fees and priority (amongst same triage users) in access to A&E care in public hospitals. Although user's fee exemptions may contribute to promote the use of S24 in the general population, they are less likely to impact the behaviour of the elderly group, since the majority is already exempted due to economic weakness or chronic disease. There are also developments on new technologies to reach S24, that again, target mainly younger users. On the other hand, both high compliance and high share of self-care disposition suggest that the reactivation of follow-up service can greatly increase both the use of the service and the health

status of elders. Follow-up calls may also increase trust in the service of S24, ensure that the elderly comply with nurses' disposition and update the disposition, if necessary.

Several methodologic limitations need to be considered in interpreting these results. First, call, rather than the individual, was used as the unit of analysis. It may be that individuals (or someone on their behalf) make more than one call to S24. As noted, validity of intention to comply has not been established. Linked data, with evidence on the users' further actions, would be needed to gain a more complete picture of the potential of S24 telephone triage as a gatekeeper for more intensive levels of care. It should also be noted that we were not able to infer callers' understanding of the nurses' disposition. Triage categories simplify the range of advice given by nurses, and therefore devalue the impact that S24 may have in users' health and wellbeing. Moreover, the results may underestimate the true impact of S24 since more than half of the 27,456 calls without information on intentions were advised to seek A&E care. A large proportion of these calls were probably due to very urgent conditions (allowing no time for the nurses to collect information about the users' intentions). In such situations, the concordance between intentions and disposition will likely be high.

The ageing population is one of the great challenges about health care policy and its impact on nursing management in the 21st century (Notara, Koupidis, Vaga, & Grammatikopoulos, 2010). A key aspect of telephone triage and advice is that it allows nurses to explore alternatives for treatment, in accordance with definitions of nursing that reflect a broadening scope that includes, not only traditional clinical roles, but also the advocacy of care as well as interpreting patient information and making decisions about actions needed (Navratil-Strawn et al., 2014). Elders may benefit particularly from this nurse mediation as studies have shown that they are more likely to have limited health literacy, both in Portugal (Paiva et al., 2017) and in other regions of the World (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005; Rajah, Hassali, & Murugiah, 2019; Sørensen et al., 2015). Health triage and advice lines should

be promoted to increase the match between the needs of elderly patients and health resources thus improving health equity.

Conclusion

This research describes the use of a telephone health triage and helpline in Portugal and explores its potential to provide health advice and to guide elders to the appropriate level of care, according to their conditions and symptoms. S24 helped to improve the appropriateness of A&E demand and reduce the overall demand for care by providing advice for self-care at home. This study shows that S24 may contribute, simultaneously, to a better use of health care resources and to enhance the care received by elders. There is nonetheless space for improvement given the considerable underuse of the line by this population group.

Implications for improving the underutilisation of the line by elders

Elders have underused S24 service (Oliveira, 2010; Simão, 2009) and educated, urban elders appear to be more likely to use it (Jácome, 2016; Oliveira, 2010; Simão, 2009). Individuals may have difficulty in judging the quality of a health care service, even after receiving it, and tend to rely on other people recommendations. GPs and primary care nurses can play an important role in promoting the use of S24.

High compliance and high share of self-care disposition suggest that the reactivation of elderly follow-up service can greatly increase both the use of the service and the health status of elders. Follow-up calls may also increase trust in the service of S24, ensure that the elderly comply with nurses' disposition and update the disposition, if needed.

Public discussion about S24 has focused on the line acting as a gatekeeper to hospital care. To encourage calls from elders, information about its full range of services should be

communicated. Moreover, trust in the line will certainly be reinforced if communication emphasises that advice is provided by trained nurses.

Further research is indicated to find ways to increase the use of S24 by the elderly population.

References

Blank, L., Coster, J., O'Cathain, A., Knowles, E., Tosh, J., Turner, J., & Nicholl, J. (2012). The appropriateness of, and compliance with, telephone triage decisions: a systematic review and narrative synthesis. *Journal of Advanced Nursing, 68*(12), 2610-2621. doi:10.1111/j.1365-2648.2012.06052.x

Bogdan, G. M., Green, J. L., Swanson, D., Gabow, P., & Dart, R. C. (2004). Evaluating patient compliance with nurse advice line recommendations and the impact on healthcare costs. *The American journal of managed care, 10*(8), 534-542.

Botelho, A., Dias, I. C., Fernandes, T., Pinto, L. M. C., Teixeira, J., Valente, M., & Veiga, P. (2019). Overestimation of health urgency as a cause for emergency services inappropriate use: Insights from an exploratory economics experiment in Portugal. *Health & Social Care in the Community, 0*(0). doi:10.1111/hsc.12720

Bunn, F., Byrne, G., & Kendall, S. (2004). Telephone consultation and triage: effects on health care use and patient satisfaction. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.cd004180.pub2

Cariello, F. P. (2003). Computerized Telephone Nurse Triage. *Journal of Ambulatory Care Management, 26*(2), 124-137. doi:10.1097/00004479-200304000-00005

Correia, I., Ferreira, P., Pinto, L. C., Valente, M., & Veiga, P. (2017). Growing old, unhealthy and unequal: an exploratory study on the health of Portuguese individuals aged 50+, NIMA Working Paper no. 67. In *NIMA Working Paper n.67*. Braga: NIMA, Universidade do Minho.

Correia, I., Norwood, P., Watson, V., & Veiga, P. (2014). What do patients want from primary care services? Final report, July. In. Braga: Report for Ministério da Saúde / INSA, IP.

Dahlgren, K., Holzmann, M. J., Carlsson, A. C., Wändell, P., Hasselström, J., & Ruge, T. (2017). The use of a Swedish telephone medical advice service by the elderly – a population-

based study. *Scandinavian Journal of Primary Health Care, 35*(1), 98-104. doi:10.1080/02813432.2017.1288816

David, O. J. (2005). NHS Direct and older people. *Age and Ageing, 34*(5), 499-501. doi:10.1093/ageing/afi115

Delichatsios, H., Callahan, M., & Charlson, M. (1998). Outcomes of telephone medical care. *Journal of General Internal Medicine, 13*(9), 579-585. doi:10.1046/j.1525-1497.1998.00179.x

Direção-Geral da Saúde. (2012). Plano Nacional de Saúde 2012-2016: versão completa. Retrieved from http://pns.dgs.pt/pns-versao-completa/

European Commission. (2015). *The 2015 Ageing Report - Economic and budgetary projections for the 28 EU Member States (2013-2060)*. Retrieved from Brussels: http://ec.europa.eu/economy_finance/publications/european_economy/2015/pdf/ee3_en.pdf

Foster, J. (2003). Do callers to NHS Direct follow the advice to attend an accident and emergency department? *Emergency Medicine Journal, 20*(3), 285-288. doi:10.1136/emj.20.3.285

Gardete-Correia, L., Boavida, J. M., Raposo, J. F., Mesquita, A. C., Fona, C., Carvalho, R., & Massano-Cardoso, S. (2010). First diabetes prevalence study in Portugal: PREVADIAB study. *Diabetic Medicine, 27*(8), 879-881. doi:10.1111/j.1464-5491.2010.03017.x

Gomes, M. (2014). *O perfil do utilizador abusivo dos Serviços de Urgência Portugueses: um estudo no Hospital de São João*. Porto: Instituto Politécnico do Porto. Escola Superior de Tecnologia da Saúde do Porto.

Hansen, E., & Hunskaar, S. (2011). Understanding of and adherence to advice after telephone counselling by nurse: a survey among callers to a primary emergency out-of-hours service in Norway. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 19*(1), 48. doi:10.1186/1757-7241-19-48

Hogenbirk, J. C., Pong, R. W., & Lemieux, S. K. (2005). Impact of Telephone Triage on Medical Service Use: Implications for Rural and Remote Areas. *Journal of Agricultural Safety and Health, 11*(2), 229-237. doi:10.13031/2013.18190

Hsu, W. C., Bath, P. A., Large, S., & Williams, S. (2011). Older people's use of NHS Direct. *Age and Ageing, 40*(3), 335-340. doi:10.1093/ageing/afr018

Huibers, L., Smits, M., Renaud, V., Giesen, P., & Wensing, M. (2011). Safety of telephone triage in out-of-hours care: A systematic review. *Scandinavian Journal of Primary Health Care, 29*(4), 198-209. doi:10.3109/02813432.2011.629150

Jácome, M. (2016). *Análise da procura da Linha Saúde 24 por utilizadores com 65 ou mais anos.* (Mestrado em Gestão de Unidades de Saúde), Universidade do Minho, Braga.

Lake, R., Georgiou, A., Li, J., Li, L., Byrne, M., Robinson, M., & Westbrook, J. I. (2017). The quality, safety and governance of telephone triage and advice services – an overview of evidence from systematic reviews. *BMC Health Services Research, 17*(1), 614. doi:10.1186/s12913-017-2564-x

Lambert, R., Fordham, R., Large, S., & Gaffney, B. (2013). A cost-minimisation study of 1,001 NHS Direct users. *BMC Health Services Research, 13*(1), 300. doi:10.1186/1472-6963-13-300

Lattimer, V., Sassi, F., George, S., Moore, M., Turbull, J., Mullee, M., & Smith, H. (2000). Cost analysis of nurse telephone consultation in out of hours primary care: evidence from a randomised controlled trial. *BMJ, 320*(7241), 1053-1057. doi:10.1136/bmj.320.7241.1053

Marklund, B., Ström, M., Månsson, J., Borgquist, L., Baigi, A., & Fridlund, B. (2007). Computer-supported telephone nurse triage: an evaluation of medical quality and costs. *Journal of Nursing Management, 15*(2), 180-187. doi:10.1111/j.1365-2834.2007.00659.x

Ministério da Saúde. (2017a, 26 February 2018). Atendimentos em Urgência Hospitalar por Triagem de Manchester. *Portal Transparência.* Retrieved from https://transparencia.sns.gov.pt/explore/dataset/atendimentos-em-urgencia-triagem-manchester/?sort=tempo

Ministério da Saúde. (2017b, 26 February 2018). Atendimentos por Tipo de Urgência Hospitalar. *Portal Transparência.* Retrieved from https://transparencia.sns.gov.pt/explore/dataset/atendimentos-por-tipo-de-urgencia-hospitalar-link/?sort=tempo

Navratil-Strawn, J. L., Hawkins, K., Wells, T. S., Ozminkowski, R. J., Hawkins-Koch, J., Chan, H., . . . Yeh, C. S. (2014). Listening to the nurse pays off: an integrated Nurse HealthLine programme was associated with significant cost savings. *Journal of Nursing Management, 22*(7), 837-847. doi:10.1111/jonm.12048

Notara, V., Koupidis, S. A., Vaga, E., & Grammatikopoulos, I. A. (2010). Economic crisis and challenges for the Greek healthcare system: the emergent role of nursing management. *Journal of Nursing Management, 18*(5), 501-504. doi:10.1111/j.1365-2834.2010.01119.x

Oliveira, S. (2010). *Linha Saúde 24: um contributo para a melhoria do funcionamento do Serviço Nacional de Saúde.* (Mestrado de Gestão de Serviços de Saúde), ISCTE, Lisboa. Retrieved from http://hdl.handle.net/10071/3626

Paasche-Orlow, M. K., Parker, R. M., Gazmararian, J. A., Nielsen-Bohlman, L. T., & Rudd, R. R. (2005). The Prevalence of Limited Health Literacy. *Journal of General Internal Medicine, 20*(2), 175-184. doi:10.1111/j.1525-1497.2005.40245.x

Paiva, D., Silva, S., Severo, M., Moura-Ferreira, P., Lunet, N., & Azevedo, A. (2017). Limited Health Literacy in Portugal Assessed with the Newest Vital Sign. *Acta medica portuguesa, 30*(12), 861-869. doi:10.20344/amp.9135

Pasini, A., Rigon, G., & Vaona, A. (2015). A cross-sectional study of the quality of telephone triage in a primary care out-of-hours service. *Journal of Telemedicine and Telecare, 21*(2), 68-72. doi:10.1177/1357633x14566573

Pereira, S., e Silva, A. O., Quintas, M., Almeida, J., Marujo, C., Pizarro, M., . . . de Freitas, A. F. (2001). Appropriateness of emergency department visits in a Portuguese University hospital. *Annals of Emergency Medicine, 37*(6), 580-586. doi:10.1067/mem.2001.114306

Rajah, R., Hassali, M. A. A., & Murugiah, M. K. (2019). A systematic review of the prevalence of limited health literacy in Southeast Asian countries. *Public Health, 167*, 8-15. doi:https://doi.org/10.1016/j.puhe.2018.09.028

Rimner, T., Blozik, E., Begley, C., Grandchamp, C., & Overbeck, J. v. (2011). Patient adherence to recommendations after teleconsultation: survey of patients from a telemedicine centre in Switzerland. *Journal of Telemedicine and Telecare, 17*(5), 235-239. doi:10.1258/jtt.2011.101013

Santana, P. (2000). Ageing in Portugal: regional iniquities in health and health care. *Social Science & Medicine, 50*(7), 1025-1036. doi:10.1016/S0277-9536(99)00352-4

Simão, H. (2009). *Estudo descritivo do perfil de utilizador da linha Saúde 24 com análise de impacto ao nível da eficiência, equidade e empowerment em comparação com o modelo inglês NHS direct.* (Mestrado de Gestão em Saúde), Universidade Nova de Lisboa, Lisboa.

Soares, S., Aidos, A., Rodrigues, M., & Guimarães, J. (2006). Efectividade do sistema de triagem telefónica Saúde 24 Pediatria num serviço de urgência pediátrica. *Revista Portuguesa de Medicina Geral e Familiar, 22*(4), 433-442.

Sørensen, K., Pelikan, J. M., Röthlin, F., Ganahl, K., Slonska, Z., Doyle, G., . . . Brand, H. (2015). Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *European Journal of Public Health, 25*(6), 1053-1058. doi:10.1093/eurpub/ckv043

Stewart, B., Fairhurst, R., Markland, J., & Marzouk, O. (2006). Review of calls to NHS Direct related to attendance in the paediatric emergency department. *Emergency Medicine Journal, 23*(12), 911-914. doi:10.1136/emj.2006.039339

Tran, D. T., Gibson, A., Randall, D., Havard, A., Byrne, M., Robinson, M., . . . Jorm, L. R. (2017). Compliance with telephone triage advice among adults aged 45 years and older: an Australian data linkage study. *BMC Health Services Research, 17*(1). doi:10.1186/s12913-017-2458-y

U.S. National Library of Medicine. (2015). Medical Subject Headings (MeSH). Retrieved from https://www.nlm.nih.gov/mesh/

Van den Heede, K., & Van de Voorde, C. (2016). Interventions to reduce emergency department utilisation: A review of reviews. *Health Policy, 120*(12), 1337-1349. doi:10.1016/j.healthpol.2016.10.002

Wheeler, S. Q., Greenberg, M. E., Mahlmeister, L., & Wolfe, N. (2015). Safety of Clinical and Non-Clinical Decision Makers in Telephone Triage: A Narrative Review. *Journal of Telemedicine and Telecare, 21*(6), 305-322. doi:10.1177/1357633X15571650

Table 1 – Dataset

Description	Count	% of relevant group
Total calls by elders in the period	*148,099*	*13% of total S24 calls in the period*
Calls excluded	374	0.3% of the calls by elders
Calls in the final dataset	*147,725*	*99.7% of the calls by elders*
Calls with missing information about intentions	27,456	18.6% of the calls in the final dataset
Calls with full information about intentions	120,269	81.4% of the calls in the final dataset

Table 2 – Users' initial intentions and nurses' dispositions

	Nurse's disposition									
	A&E care		***Urgent GP care***		***Non-urgent care***		***Self-care at home***		***Total***	
Initial intention	**Count (%)**	***%***	**Count (%)**	***%***	**Count (%)**	***%***	**Count (%)**	***%***	**Count (%)**	***%***
A&E care	**35,876 (73.7%)**	***51.3***	19,247 (55.8%)	*27.5*	8,227 (41.0%)	*11.7*	6,617 (38.9%)	*9.5*	69,967 (58.2%)	*100.0*
Urgent GP care	2,443 (5.0%)	*22.2*	**5,085 (14.7%)**	***46.2***	1,753 (8.7%)	*8,7*	1,716 (10.1%)	*15.6*	10,997 (9.1%)	*100.0*
Non-urgent care	2,560 (5.3%)	*22.1*	2,788 (8.1)	*24.1*	**3,851 (19.2%)**	***19,2***	2,392 (14.1%)	*20.6*	11,591 (9.6%)	*100.0*
Self-care at home	7,827 (16.1%)	*28.2*	7,363 (21.4)	*26.6*	6,226 (31.0%)	*31,0*	**6,298 (37.0%)**	***22.7***	27,714 (23.0%)	*100.0*
Total	48,706 (100.0%)	*40.5*	34,483 (100.0%)	*28.7*	20,057 (100.0%)	*16.7*	17,023 (100.0%)	*14.2*	**120,269 (100.0%)**	***100.0***

Example: 2,443 users initially intending to seek Urgent GP care were advised by S24 nurses to seek A&E care instead; these users were 22.2% of the total 10,997 users initially intending to seek Urgent GP care; these users were also 5.0% of the total 48,706 users advised by S24 nurses to seek A&E care.

Table 3 – Concordance between the users' initial intentions and the disposition of the nurses

	Sex		**Age**		**Time of the call**		**Calls given disposition**
Care intensity	Female	Male	65-79	80 or older	Working hours	Out-of-hours	
A&E care	72.4%	75.6%	70.4%	77.6%	74.6%	72.8%	73.7%
Urgent GP care	15.0%	14.2%	15.6%	13.4%	17.2%	12.3%	14.7%
Non-urgent care	19.4%	18.9%	18.8%	19.9%	22.4%	16.4%	19.2%
Self-care at home	38.8%	33.8%	38.9%	32.8%	36.1%	37.8%	37.0%
Calls by group	41.8%	43.8%	39.9%	46.5%	43.9%	41.2%	42.5%

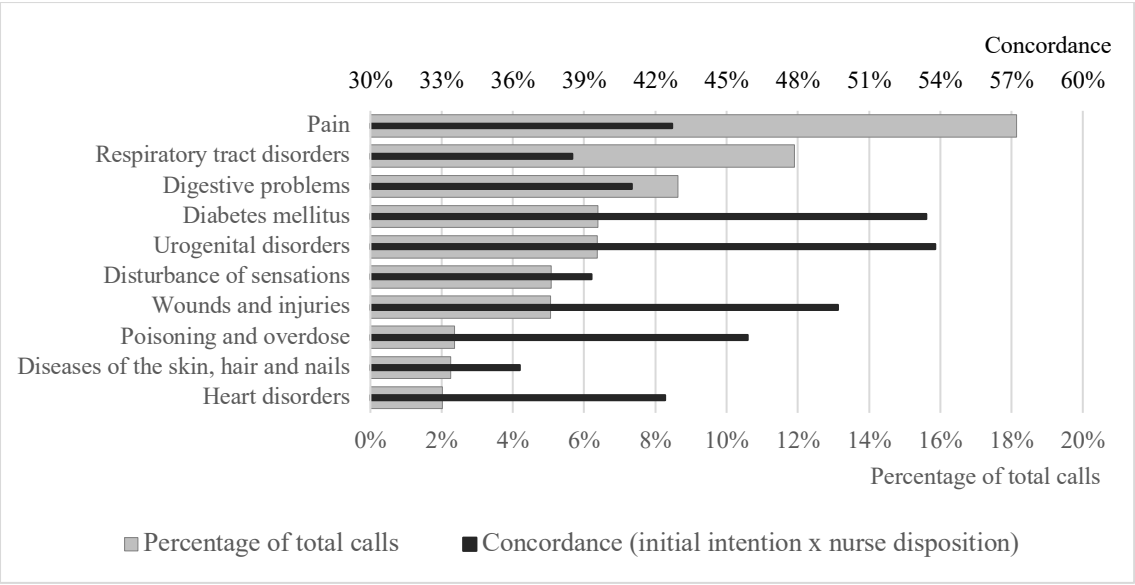
Figure Legends

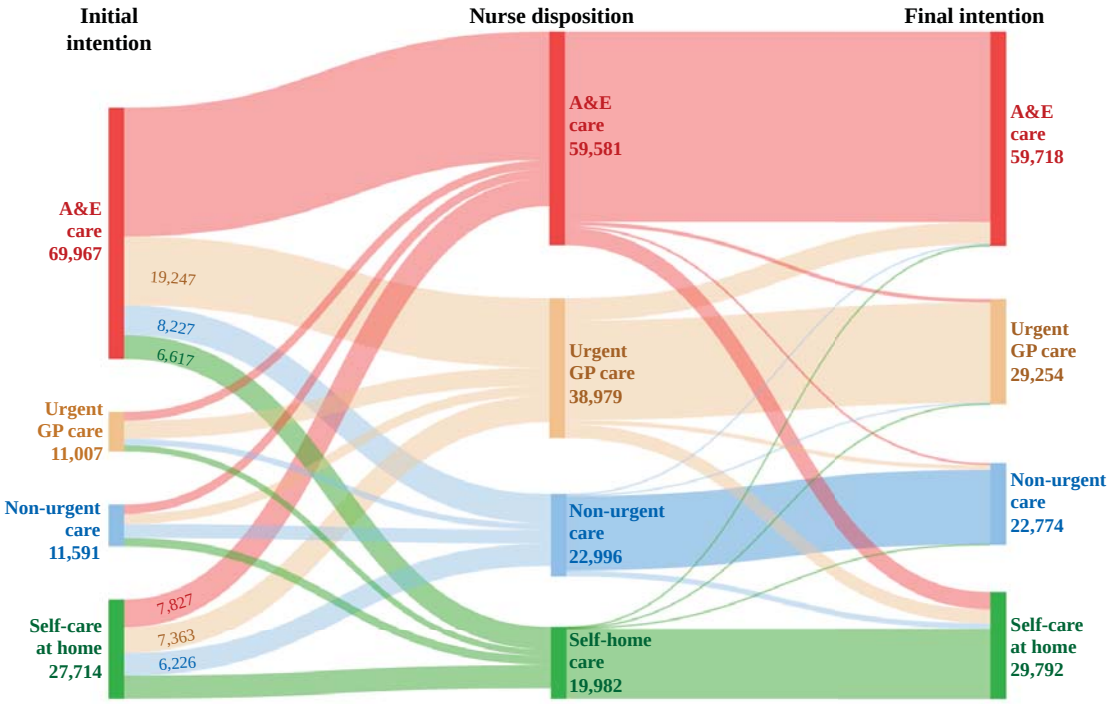
Fig. 1 - Main reported symptom standardised categories and related concordance between the nurses' dispositions and the users' initial intentions

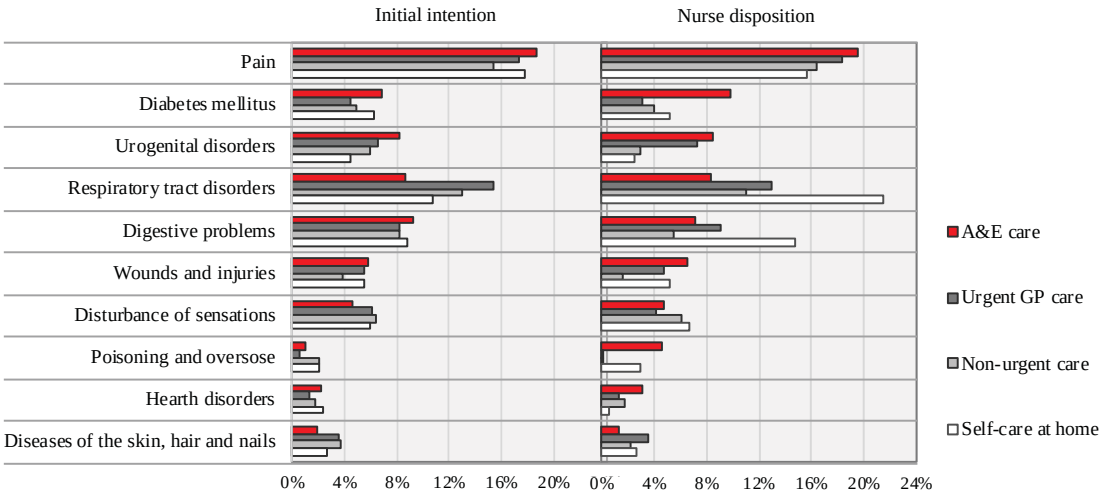
Fig. 2 – Comparison between S24 nurses' dispositions and self-reported initial and final intentions of the users

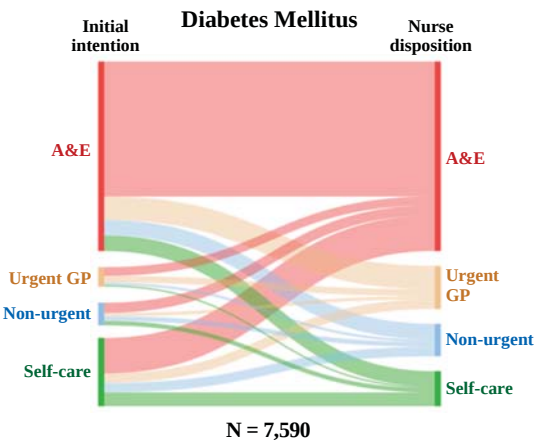
Fig. 3 – Relative importance of main symptom categories in the users' initial intentions and S24 nurses' dispositions (ordered by frequency of symptom category when nurses' disposition was A&E care)

Fig. 4 – Comparison between S24 nurses' dispositions and self-reported initial intentions of the users with diabetes mellitus, urogenital disorders, respiratory tract disorders and digestive problems

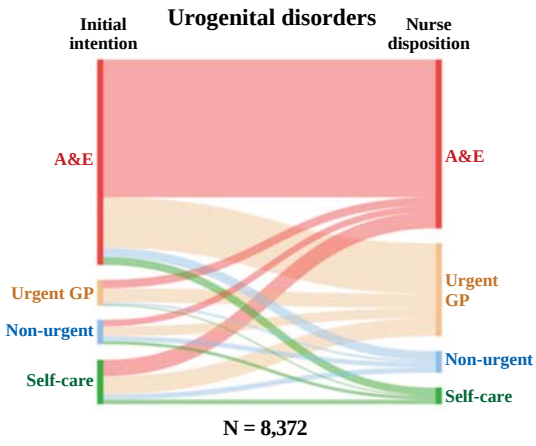

Concordance
30% 33% 36% 39% 42% 45% 48% 51% 54% 57% 60%
Pain
Respiratory tract disorders
Digestive problems
Diabetes mellitus
Urogenital disorders
Disturbance of sensations
Wounds and injuries
Poisoning and overdose
Diseases of the skin, hair and nails
Heart disorders
0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20%
Percentage of total calls
Percentage of total calls
Concordance (initial intention x nurse disposition)


Initial intention
Nurse disposition
Final intention
A&E care 69,967
Urgent GP care 11,007
Non-urgent care 11,591
Self-care at home 27,714
19,247
8,227
6,617
7,827
7,363
6,226
A&E care 59,581
Urgent GP care 38,979
Non-urgent care 22,996
Self-home care 19,982
A&E care 59,718
Urgent GP care 29,254
Non-urgent care 22,774
Self-care at home 29,792

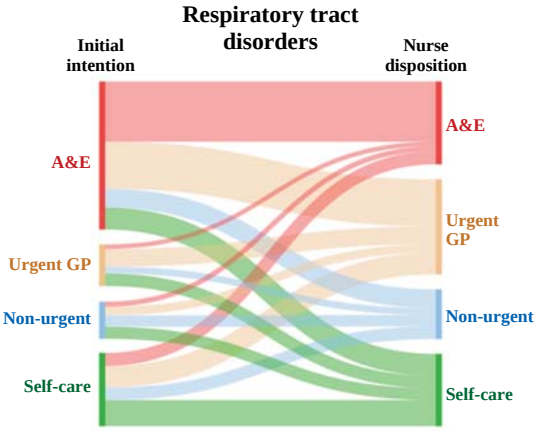

Initial intention
Nurse disposition
Pain
Diabetes mellitus
Urogenital disorders
Respiratory tract disorders
Digestive problems
Wounds and injuries
Disturbance of sensations
Poisoning and oversose
Hearth disorders
Diseases of the skin, hair and nails
0%
4%
8%
12%
16%
20%
0%
4%
8%
12%
16%
20%
24%
A&E care
Urgent GP care
Non-urgent care
Self-care at home



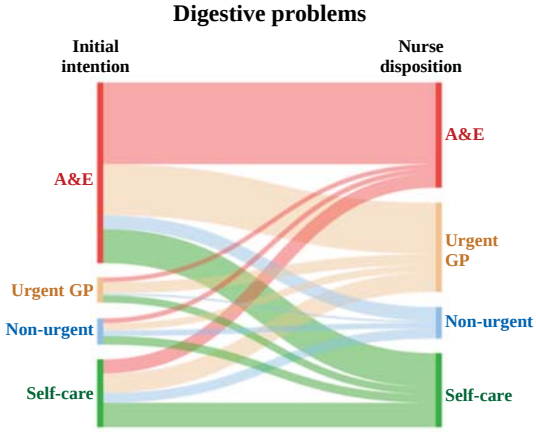
N = 7,590



N = 8,372



N = 12,179



N = 10,737