Use of out-of-hours services for respiratory tract infections

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Introduction

More than twenty years after my first out-of-hour session as an intern in Austevoll, a small island municipality in Western Norway, I still perceive working sessions in the local out-of-hours GP cooperative as demanding, sometimes difficult. A stream of unknown people with different complaints, ranging from simple, easy-to-resolve problems to grave diseases with fatal outcomes, requires constant vigilance and focus. In almost every session, I meet people with respiratory tract infections, many of whom have minor symptoms and a good general condition. Their presence in the out-of-hours GP cooperative has been a puzzle to me, both in my role as a clinical doctor and head physician of the Hedmarken out-of-hours GP cooperative. The riddle bothered me enough to search for answers that, in the end, led to this thesis. The past years have been a journey of curiosity, education, frustration, and joy.

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Summary

Respiratory tract infections (RTIs) are mainly self-limiting with low urgency. Norwegian out-of-hours services handle 13 % of all RTIs in primary health care and prescribe about 20 % of the total human antibiotic consumption. Nurses use triage scales and assess all callers to out-of-hours GP cooperatives, deciding whether the caller can manage with self-care, seek their GP later, or need a doctor's consultation out-of-hour. This thesis explores how RTIs are assessed and handled in out-of-hours GP cooperatives by telephone triage nurses and doctors.

Firstly, we did a retrospective data analysis examining antibiotic prescription rates for RTIs and factors correlating with antibiotic prescribing in two out-of-hours GP cooperatives. Secondly, we conducted a focus group study among telephone triage nurses, exploring their experiences with and attitudes towards assessing RTI callers. The interviews were transcribed verbatim and analysed according to systematic text condensation. Thirdly, we did a pragmatic, randomised, controlled educational intervention about RTIs for telephone triage nurses in out-of-hours GP cooperatives serving 59 % of the Norwegian population. We also sought to describe the epidemiology of out-of-hours GP cooperatives in the winter season before the intervention.

We found that the antibiotic prescription rate for RTIs in out-of-hours GP cooperatives was 34.2 %. The proportion of penicillin-V was 69.9 %. Antibiotic prescribing increased with increasing busyness, measured as the median duration of consultations per session. People with tonsillitis and sinusitis had the highest odds ratio of receiving an antibiotic prescription.

In the focus group study, we found that telephone triage nurses are ambivalent gatekeepers to out-of-hours GP cooperatives. They prefer the term service provider to describe their own role, while they play a de facto gatekeeping role. The nurses search for consensus with callers through negotiations and strategies and perceive that triage scales are inferior to their clinical skills when assessing callers with RTIs. Telephone triage nurses describe how structural factors, like the doctors' fee-for-service plan, or

low capacity in the GP scheme, largely determine how the population use the out-of-hours GP cooperatives.

The educational intervention influenced neither the number of RTI consultations in out-of-hours GP cooperatives nor consultations for all diagnoses or RTIs in list-holding GP practices. The proportion of RTIs diagnosed in out-of-hours GP cooperatives in the three winter months was 22.4 %, while the corresponding proportion for list-holding GPs was 13.7 %. In primary healthcare, 53.3 % of laryngitis and 24.5 % of sore throat were diagnosed out-of-hour.

Doctors in out-of-hours GP cooperatives need working conditions that facilitate appropriate antibiotic prescribing, such as fixed salaries. Municipalities should therefore consider fixed salaries in their cooperatives. Telephone triage nurses must have clinical skills and triage scales to assess callers with RTIs. They also need enough time to negotiate with the callers to reach a consensus when they judge that other measures than consultation out-of-hours are appropriate. Leaders of out-of-hours GP cooperatives should facilitate discussions between the local nurses and doctors, aiming for common attitudes and practices on handling RTIs within their entities.

There is a need for more research on the perspective of RTI callers to out-of-hours services and how they perceive receiving advice instead of a doctor’s consultation. Exploring how doctors perceive and practice antibiotic stewardship in Norwegian out-of-hours services is also necessary. In addition, there is a need to explore and evaluate measures that may influence the number of RTI consultation rates in out-of-hours services, like broader interventions addressing the public and GPs, in addition to doctors and nurses in out-of-hours GP cooperatives.

Norsk sammendrag

Luftveisinfeksjoner er i stor grad selvbegrensende og har lav hastegrad. Legevakt håndterer 13 % av alle luftveisinfeksjoner i norsk primærhelsetjeneste og står for 20 % av antibiotikaforskrivning til mennesker. Sykepleiere hastegradsvurderer alle innringere til legevakt og bestemmer om de kan klare seg hjemme med et råd, må oppsøke fastlege senere eller trenger en legetime på legevakten. Denne avhandlingen utforsker hvordan luftveisinfeksjoner vurderes og håndteres på norske legevakter, både av sykepleiere og leger.

Vi gjennomførte først en retrospektiv dataanalyse hvor vi undersøkte forskrivningsrater for luftveisinfeksjoner på to norske legevakter og identifiserte faktorer som korrelerer med antibiotikaforskrivning. Deretter gjennomførte vi en fokusgruppestudie blant legevaktsykepleiere, hvor vi utforsket deres erfaringer med, og holdninger til, hastegradsvurdering av innringere med luftveisinfeksjoner. Intervjuene ble transkribert og analysert etter systematisk tekstkondensering. Til slutt utførte vi en pragmatisk, randomisert, kontrollert pedagogisk intervensjon om luftveisinfeksjoner for legevaktsykepleiere på legevakter som til sammen betjener 59 % av Norges befolkning. Vi ønsket også å beskrive legevaktepidemiologi i vintersesongen før intervensjonen.

Vi fant at de to legevaktenes forskrivningsrate for luftveisinfeksjoner var på 34.2 %. Andelen smalspektret penicillin var 69.9 %. Antibiotikaforskrivning økte med økende travelhet målt som median konsultasjonstid per vakt. Personer med tonsillitt og sinusitt hadde høyest odds ratio for å få antibiotikabehandling.

I fokusgruppestudien fant vi at legevaktsykepleiere er ambivalente portvoktere for legevakt. De foretrekker å bruke betegnelsen service-ytere om sin egen rolle, men de utøver en reell portvokterfunksjon. Sykepleierne søker å oppnå konsensus med innringere gjennom forhandlinger og strategier, og de ser på hastegradsverktøy som mindre nyttige enn egen klinisk kompetanse for å vurdere innringere med luftveisinfeksjon. De beskriver at strukturelle faktorer, som legenes stykkprisfinansiering eller lav kapasitet i fastlegeordningen, i stor grad styrer hvordan befolkningen bruker legevakt.

Den pedagogiske intervensjonen påvirket verken antall luftveiskonsultasjoner på legevakt eller antall luftveiskonsultasjoner eller konsultasjoner for alle diagnoser hos fastlege. Andelen pasienter med luftveisinfeksjon var 22.4 % på legevakt og 13.7 % i fastlegepraksis i løpet av tre vintermåneder. Av alle som konsulterte primærhelsetjenesten for laryngitt og tonsillitt, diagnostiserte legevakt henholdsvis 53.3 % og 24.5 %.

Legevaktleger må ha arbeidsforhold som medvirker til riktig antibiotikaforskrivning, slik som fastlønn. Kommunene bør derfor vurdere å innføre fastlønn på legevakt. Legevaktsykepleiere trenger klinisk kompetanse, i tillegg til hastegradsverktøy, for å vurdere innringere med luftveisinfeksjoner. De må også ha nok tid til å kunne forhandle seg fram til konsensus med innringere når de vurderer at konsultasjon på legevakten ikke er nødvendig. Legevaktledere bør legge til rette for faglige diskusjoner mellom legevaktsykepleiere og legevaktleger slik at det etableres en felles lokal holdning til, og håndtering av, luftveisinfeksjoner.

Det er behov for forskning på hvordan folk som ringer legevakten med luftveisinfeksjoner opplever og vurderer det å få råd fra sykepleier i stedet for legekonsultasjon. Man bør også utforske hvordan leger opplever og praktiserer antibiotikaforskrivning på legevakt, og det bør gjennomføres studier som utforsker og evaluerer brede intervensjoner som retter seg mot publikum, fastleger, legevaktsykepleiere og legevaktleger.

List of publications

1. Lindberg, Bent Håkan; Gjelstad, Svein; Foshaug, Mats & Høye, Sigurd (2017).
Antibiotic prescribing for acute respiratory tract infections in Norwegian primary care out-of-hours service.
Scandinavian Journal of Primary Health Care. ISSN 0281-3432. 35(2), p. 178–185.
DOI: 10.1080/02813432.2017.1333301

2. Lindberg, Bent Håkan; Rebnord, Ingrid Keilegavlen & Høye, Sigurd (2021).
Phone triage nurses' assessment of respiratory tract infections–the tightrope walk between gatekeeping and service providing. A qualitative study.
Scandinavian Journal of Primary Health Care. ISSN 0281-3432. 39(2), p. 139–147.
DOI: 10.1080/02813432.2021.1908715

3. Lindberg BH, Rebnord IK, Høye S (2023).
Effect of an educational intervention for phone triage nurses on out-of-hours attendance: a pragmatic randomised controlled study.
BMC Health Services Research. ISSN 1472-6963. 23(1):4.
DOI: 10.1186/s12913-022-08994-0

List of abbreviations

AMR: antimicrobial resistance

BIC: Bayesian information criterion

CRP: C-reactive protein

GP: general practitioner

ICPC-2: International Classification of Primary Care 2nd edition

QIC: quality improvement collaboratives

RTI: respiratory tract infection

SMS: short message service

STC: systematic text condensation

1 Background

1.1 Organization of the Norwegian healthcare system

1.1.1 General aspects of primary healthcare

Norwegian healthcare is largely publicly financed, semi-decentralised and based on the principle of equal access for all inhabitants (1). The state owns and runs hospitals and emergency care, while the 356 municipalities are responsible for primary healthcare, both in-hour and out-of-hour (2).

All inhabitants have the right to a list-holding general practitioner (GP), and 99.8 % of the population use this privilege (3). Most municipalities chose a contract where list-holding GPs are self-employed and reimbursed through fixed payments per listed patient and a fee-for-service scheme (4). The municipalities administer the fixed payment, while the Norwegian Health Economics Administration pays the fee-for-service. The state finances both. Patients pay a medical fee to the GPs of 212 NOK per consultation in-hour and 332 NOK out-of-hour (as of 2022). When the maximum amount of 2921 NOK per year is paid, any further consultations in the current year are free. An increasing minority of list-holding GPs are salaried, entirely or in combination with activity-based incentives (5). Regardless of contract details, all list-holding GPs are obliged to offer service to their patients, planned and emergent, Monday through Friday between 8 am and 4 pm (6). In 2020 there were 4951 GP practices, with a mean population size of 1068 individuals per practice (3). The mean consultation rate of list-holding GPs was 2.8 consultations per inhabitant (7).

Doctors in primary care are mandatory gatekeepers to secondary healthcare 24/7. However, the public may surpass the gatekeeper and call the emergency service number 113 directly in high-urgency conditions and situations (8). A nurse or a paramedic will assess the callers' medical needs. Suspected fast-track conditions, like a heart attack or stroke, will be sent directly to an emergency department by ambulance. Non-fast-track conditions will be transferred to primary healthcare for assessment, whether in-hour or out-of-hours.

1.1.2 Organization of out-of-hours primary healthcare

Geographical differences, local variations, and municipality ownership result in different ways of organising primary care out-of-hours services in Norway. An increasing number of municipalities have merged their out-of-hours services into large-scale GP cooperatives (more than 15 doctors taking turns being on duty) serving the population in their area. However, rota groups (four to 15 doctors) are also common (9, 10). This change follows a European trend of upscaling and centralising out-of-hours services (9, 11).

There were 168 Norwegian out-of-hours clinics in 2022, covering a median population of 12 823 (450 – 699 827) (12, 13). GPs and nurses staff the clinics, but other healthcare personnel like paramedics may also be employed. List-holding GPs are obliged to work sessions in the out-of-hours service. Nevertheless, other doctors, such as locums and hospital doctors, manage 42 % of out-of-hours consultations nationwide (14). This share has been constant since 2013, despite a reported increase in day-time workload for list-holding GPs during the past years (15, 16).

The municipalities pay the salaries for nurses and other healthcare personnel. For doctors, there are different solutions in different municipalities. They may keep the patient fees and the governmental fee-for-service payment, or they receive a fixed rate per hour, and the municipalities keep the activity-generated income. Some doctors receive a combination of the two. Hence, the municipalities' operating expenses for the out-of-hours services include salaries for nurses and other healthcare personnel and any fixed payment to the doctors subtracted possible activity-based income.

Except for the out-of-hours service in Oslo, the population is encouraged to call the national number of 116 117, as opposed to direct attendance, if they perceive a medical need out-of-hour. The callers are automatically directed to the local emergency medical communication centre. These centres must be staffed by health personnel with bachelor's degrees, mainly nurses (2). There were 95 such centres in 2020, of which 75 were co-located with an out-of-hours clinic (10).

Telephone triage nurses assess the callers' symptoms and direct them to the right level of care: direct transfer to the emergency service, consultation with a doctor in the out-of-hours clinic or nurse counselling. The nurses' counsel may be to seek the list-holding GP at an appropriate time or self-care. Of all calls to local emergency medical communication centres in 2014, 23 % were handled by nurse counselling only (17).

1.2 The role of out-of-hours services in healthcare

There are different ways of organising health emergency services between countries and settings. In most countries, hospital emergency departments are supposed to receive patients with traumas and high-urgency conditions for initial assessment and treatment. However, patients with non-urgent problems may seek hospital emergency departments for different reasons, and there is concern about the effects of inappropriate use of these emergency departments. When dealing with non-urgent problems, the capacity challenge makes prioritising and handling urgent cases more difficult (18). This has severe consequences for the patients, including an increased mortality rate. A systematic review found a prevalence of inappropriate use of emergency departments between 20 and 40 % worldwide (19).

A systematic review found that poor access to primary care increases emergency department crowding, and interventions that raise access to GPs seem to decrease inappropriate use (18). Primary healthcare services that execute a gatekeeping role may reduce hospitalisations and the use of specialist care (20). The advantages of GPs being gatekeepers were elaborated on in the classic paper "The Gatekeeper and the Wizard: a fairy tale" (21). However, more than 30 years after its publication, the GPs' role as gatekeepers is still controversial and is non-existing in several European countries (22).

GPs' workload has increased significantly in many countries in recent years, indicating an increased demand for health services, increasing expectations, and an ageing population (16, 23-25). The same trends have been seen in Norway. The Norwegian list-holding GP scheme has had an activity increase of 13 % since 2012 (fig. 1) (7). The share of the population older than 65 years has increased from 15.4 %

to 18.2 % in the same period (fig. 2) (26). In addition, primary care is not excluded from the challenge of overdiagnoses and overtreatment that uses health resources ever-increasingly (27). The capacity problems of the Norwegian list-holding GP scheme are an essential backdrop even for conversations about the out-of-hours service.

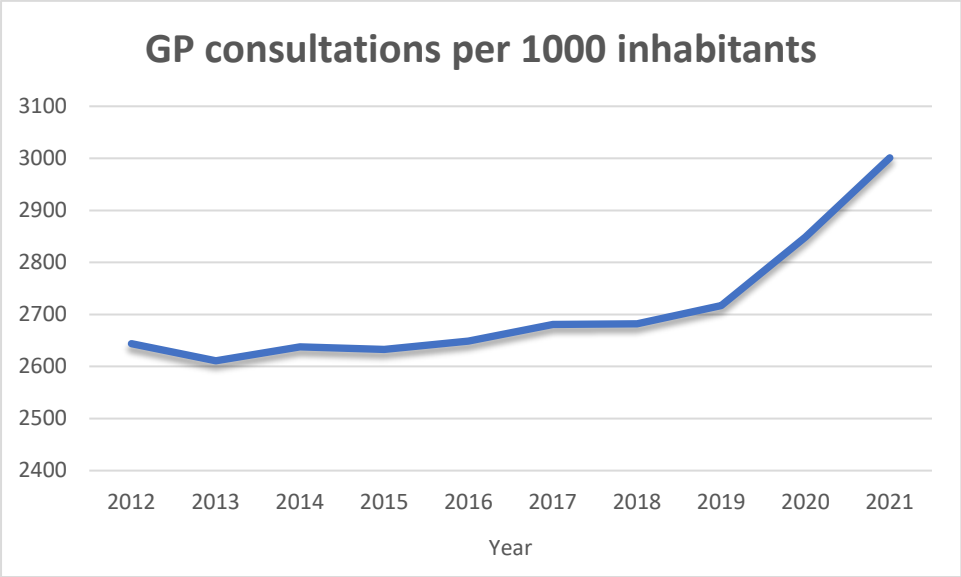

Figure 1 Number of list-holding GP consultations per thousand inhabitants (broken y-axis) (Data from Statistics Norway)

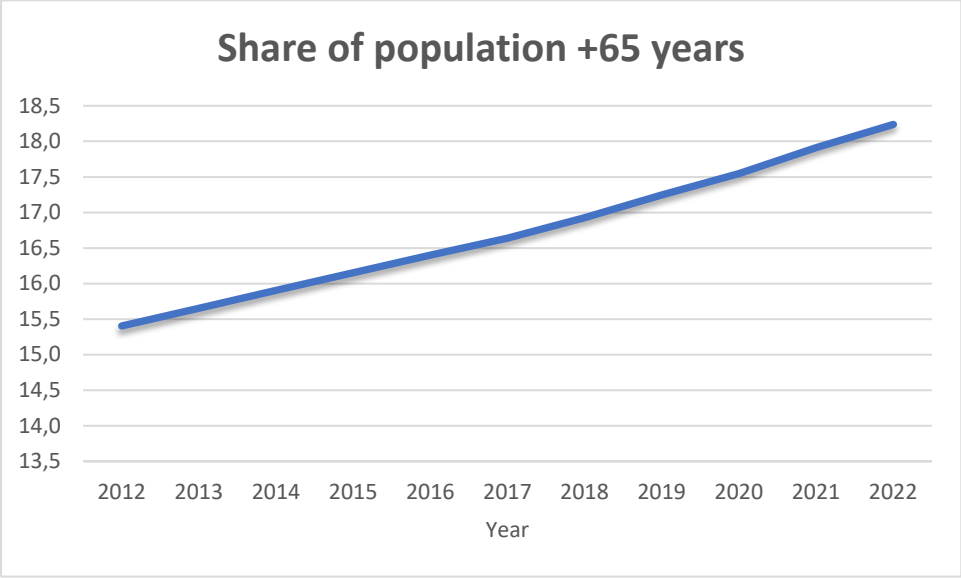

Figure 2 Share of the Norwegian population over 65 years (Data from Statistics Norway)

As for emergency departments, out-of-hours GP cooperatives have capacity challenges and may need gatekeeping. These challenges are more intuitive than in-hour primary care, as fewer doctors are supposed to serve larger populations than list-holding GPs during the daytime. Hence, there must be priorities, preferably based on medical assessments, to avoid crowding out patients with the highest needs and ensure the efficient use of resources. This priority is visible in the statistics on the use of primary care. The consultation rate in Norwegian out-of-hours service was 252 per 1000 inhabitants in 2019, compared to 2717 for list-holding GPs (7, 28). For 2020, the pandemic very much influenced the numbers (29). Other European countries have similar rates as the Norwegian, but settings, organisational factors and study limitations make direct comparisons difficult (30, 31).

A public health perspective is also essential for priorities in primary healthcare. Continuity of care is important for a well-functioning health service, contributing to lower mortality, lower costs, and fewer acute hospitalisations (32, 33). Hence, there are several good reasons for directing people to their list-holding GPs whenever safe to wait, restricting the out-of-hours care for urgent matters.

There are indications that the populations of various European countries use out-of-hours services inappropriately. Dutch GPs think that the number of out-of-hours contacts could be reduced (34), and Danish GPs assessed one of four out-of-hours contacts as medically inappropriate (35). Almost one in four patients in Oslo's out-of-hours service considered their problems non-urgent, while the doctors considered 64 % of the encounters non-urgent (36).

A few studies have assessed the characteristics of patients who use the out-of-hours service inappropriately according to the assessment of healthcare personnel. Medically inappropriate contacts with Danish out-of-hours service were associated with long symptom duration, younger patients, exacerbation of chronic disease and time of the day for the contact (35). Dutch patients had long-existing problems and low self-assessed urgency, and they believed the out-of-hours service to be intended for all requests for help (37).

To sum up, there seems to be a mismatch between different populations' expectations and the views and expectations of stakeholders in out-of-hours primary care.

1.3 Epidemiology of out-of-hours service

There is a high degree of consistency concerning patients' age in the out-of-hours primary care setting across several European countries, with higher attendance for the youngest and the eldest age groups (38). Even for the diagnostic scope, the numbers are similar between countries, with the International Classification of Primary Care 2nd edition (ICPC-2) chapters "General and Unspecified", "Musculoskeletal", "Respiratory", and "Skin" as the most frequent (39). Denmark, the Netherlands, and Norway show a particular consistency.

Reliable numbers on contact rates in, or nurses' assessment of callers to, the out-of-hours services are not included in the data bank Statistics Norway nor other available data banks. Hence, the Watch-tower project is the most reliable source for such information (40). This is a sentinel network of out-of-hours GP cooperatives considered representative of the Norwegian out-of-hours service. The enrolled cooperatives produce continuous clinical and activity data that can be used for research and the yearly reports from The National Centre for Emergency Primary Health Care (41).

Nurses in the Watch-tower project register what the patients report as the direct reason for contacting the out-of-hours at the first contact, referred to as the reason for encounter, using codes primarily from the symptom chapters of ICPC-2 (42). The reason for the encounter will often differ from the diagnosis given by a doctor after the medical consultation. It is encumbered with uncertainty, especially since there is a widespread use of codes from chapter A – General and Unspecified. However, statistics on the reason for encounter from the Watch-tower project yield an impression of how telephone triage nurses judge the populations' reasons for contacting healthcare out-of-hours. The ICPC-2 chapters R (respiratory) and E (ear),

corresponding to RTIs, constituted 14.7 % of all reasons for encounters in 2014 and 2015 (table 1). This number corresponds well with the number of RTI diagnoses in doctors' consultations (table 2), indicating coherence in the reported symptoms from the telephone calls throughout the consultations.

Reasons for encounter in the Watch tower sentinel out-of-hours services in 2014 and 2015

ICPC-2 Chapter (RFE)	N	%	(95 % CI)
A - General and unspecified	28741	16,2 %	(16,1 to 16,4)
L - Musculoskeletal	28710	16,2 %	(16,0 to 16,4)
R - Respiratory	21775	12,3 %	(12,1 to 12,5)
D - Digestive	17732	10.0%	(9,9 to 10,2)
S - Skin	17365	9,8 %	(9,7 to 9,9)
U - Urology	9470	5,3 %	(5,2 to 5,5)
N - Neurological	7468	4,2 %	(4,1 to 4,3)
P - Psychological	7232	4,1 %	(4,0 to 4,2)
E - Eye	6886	3,9 %	(3,8 to 4,0)
K - Circulatory	4461	2,5 %	(2,4 to 2,6)
H - Ear	4294	2,4 %	(2,4 to 2,5)
W - Pregnancy, childbirth, family planning	1719	1,0 %	(0,9 to 1,0)
X - Female genital system and breast	1360	0,8 %	(0,7 to 0,8)
Y - Male genital system	971	0,5 %	(0,5 to 0,6)
Z - Social problems	833	0,5 %	(0,4 to 0,5)
T - Endocrine, metabolic and nutritional	787	0,5 %	(0,4 to 0,5)
B - Blood, lymphatic and spleen	420	0,2 %	(0,2 to 0,3)
Unknown	16738	9,5 %	(9,3 to 9,6)
All encounters	177053	100,0 %	

Table 1 Reasons for encounter, all ICPC-2 chapters, all urgency levels.
Raknes and Hunskaar BMC Emerg Med 2017, licensed under CC-BY 4.0 (39).

1.4 Respiratory tract infections in out-of-hours services

RTIs are mainly self-limiting and low-urgent, largely independent of their microbiological nature as viral or bacterial (43). Data from the sentinel network show that nurses coded 76 % of RTIs as low-urgency cases and only 0.02 as high-urgency cases (42). Hence, most RTIs could be judged medically inappropriate in an out-of-hours setting.

Nevertheless, these infections are frequent reasons for encounters and, consequently, consultation rates. They contribute to an increased workload and busy sessions in out-of-hours GP cooperatives, which may impair clinical quality.

Different ways to categorise RTIs in research depend on which classification system the investigated healthcare uses. For Norwegian primary healthcare, ICPC-2 is mandatory to label diagnoses (39). Several Norwegian studies, including this dissertation, therefore delimit RTIs according to ICPC-2: all R-diagnoses (except R06 and R84-R99) in addition to H-diagnoses indicating otitis media (H01, H70-72, H74) (44-46). Even though these infections are very different in localisation, they all affect part of the respiratory tract or adjacent structures. By including symptom descriptions (R01-R29 and H01), infections not precisely diagnosed are incorporated, reflecting the uncertainty of the diagnostic scope in primary care.

Literature on the epidemiology of RTIs in out-of-hours services is sparse, as most studies focus on antibiotic prescribing and not on diagnoses or contact rates. Hence, a comparison with in-hour epidemiology is pertinent. According to Statistics Norway, the 2019 consultation rate for RTIs in Norwegian out-of-hours service was 38 per 1000 inhabitants and 244 for list-holding GPs (table 2) (28). The rate corresponds to 15 % of all consultations out-of-hour and 9 % in-hour (7, 28). The dataset does not permit a search on consultation rates for specified periods within a year nor on specified diagnoses within each ICPC-2 chapter.

Consultations per 1000 inhabitants	Out-of-hour	In-hour
Respiratory tract infections	38	244
Local pain and inflammations	21	221
Low back problems	6	98
General pain and muscle aches	2	36
Rheumatism and joint problems	1	52
Mental disorders	12	294
Atopy, asthma, allergy, or eczema	9	96
Hypertension and heart disease	3	189
Cancer	1	41
Female genital afflictions	2	41
Functional stomach/intestinal afflictions	19	111
Skin infections	6	55
Accidents and injuries	38	90
Pregnancy, birth, contraception	2	97
Fear of disease	1	16
Other diagnoses	91	1035
Total	252	2716

Table 2 Groups of diagnoses in consultations per 1000 inhabitants for the year 2019 (Data from Statistics Norway)

A Swedish study found an RTI contact rate of 32 per 1000 inhabitants out-of-hour and 246 in-hour (47). The RTIs of the highest frequency were upper RTIs (19 %), pharyngotonsillitis (13 %) and acute otitis media (13 %).

Gjelstad et al. reported absolute numbers of RTIs from Norwegian list-holding GPs (44). Upper RTIs and respiratory symptoms, acute bronchitis, acute otitis media, and ear pain were the most frequently used respiratory tract diagnoses (44, 45). Dyrkorn et al. reported the same pattern from the out-of-hours service in Trondheim; upper RTIs, acute otitis media and tonsilitis were the most frequently diagnosed RTIs (46). Neither in this study were the denominators reported. Hence, there is a knowledge gap on the consultation rates for different RTIs in Norwegian out-of-hours GP cooperatives.

1.5 Antibiotic prescribing in primary healthcare

Antimicrobial resistance (AMR) threatens public health globally, and the fight against AMR has been included in United Nations' sustainable development goals (48). The link between outpatient antibiotic use and AMR is well-established (49). At the beginning of the antibiotic era, antibiotic treatment was reserved for severe infections with the intention of saving lives. Later, the indication was widened to include symptom relief. The consumption rose, and so did AMR. For a long time, the problem was handled by the invention of new antibiotic drugs. However, during the last 30 years, hardly any new antimicrobial drugs have been discovered, and very few are in the pipeline (50, 51). Thus, one of the main possible actions in the current situation is to reduce consumption. Antimicrobials do not affect viral RTIs and have limited effect on most bacterial RTIs (52). Hence, these infections are essential targets for reducing antibiotic consumption.

Antibiotic prescribing differs in various European countries and settings regarding both amount and type (53). Scandinavian countries and the Netherlands have lower antibiotic consumption and AMR rates than other European countries. Norway has around 50 % higher antibiotic consumption per 1000 inhabitants than countries like Sweden, Germany and the Netherlands (54). However, methenamine, a drug which does not induce AMR, constitutes 30 % of Norwegian consumption (55, 56). If methenamine is excluded from the statistics, antibiotic consumption is about the same as in the other countries, explaining the equal AMR rates (57).

Around 85 % of human antibiotics consumed in Norway are prescribed in primary care, with more than 50 % for RTIs (55). The out-of-hours proportion is probably around 20 %, based on the consultation and prescribing rates from in-hour. Hence, targeting out-of-hours prescribing for this group of infections may be an important contribution to reducing antibiotic consumption.

1.6 Antibiotic consumption out-of-hour – a chain of events

As antibiotic use significantly influences AMR, it is pertinent to discuss decisions and steps leading to human consumption. For a person to take antibiotics after a visit to a Norwegian out-of-hours GP cooperative, there must be no missing link in a chain of events (figure 3). First, the person must have symptoms and decide to call 116 117. Second, the nurse answering the telephone must assess that the caller's symptoms need medical attention out-of-hours and assign a consultation with a doctor. Third, the doctor on duty must judge that the person has an infection requiring treatment and prescribe antibiotics. Fourth, the person must go to a pharmacy with the prescription and buy the medicine. Fifth, the person must consume what has been bought. All these links in what one may call the "out-of-hour chain of antibiotics" are necessary for antibiotic consumption, and each can be targeted to reduce inappropriate use.

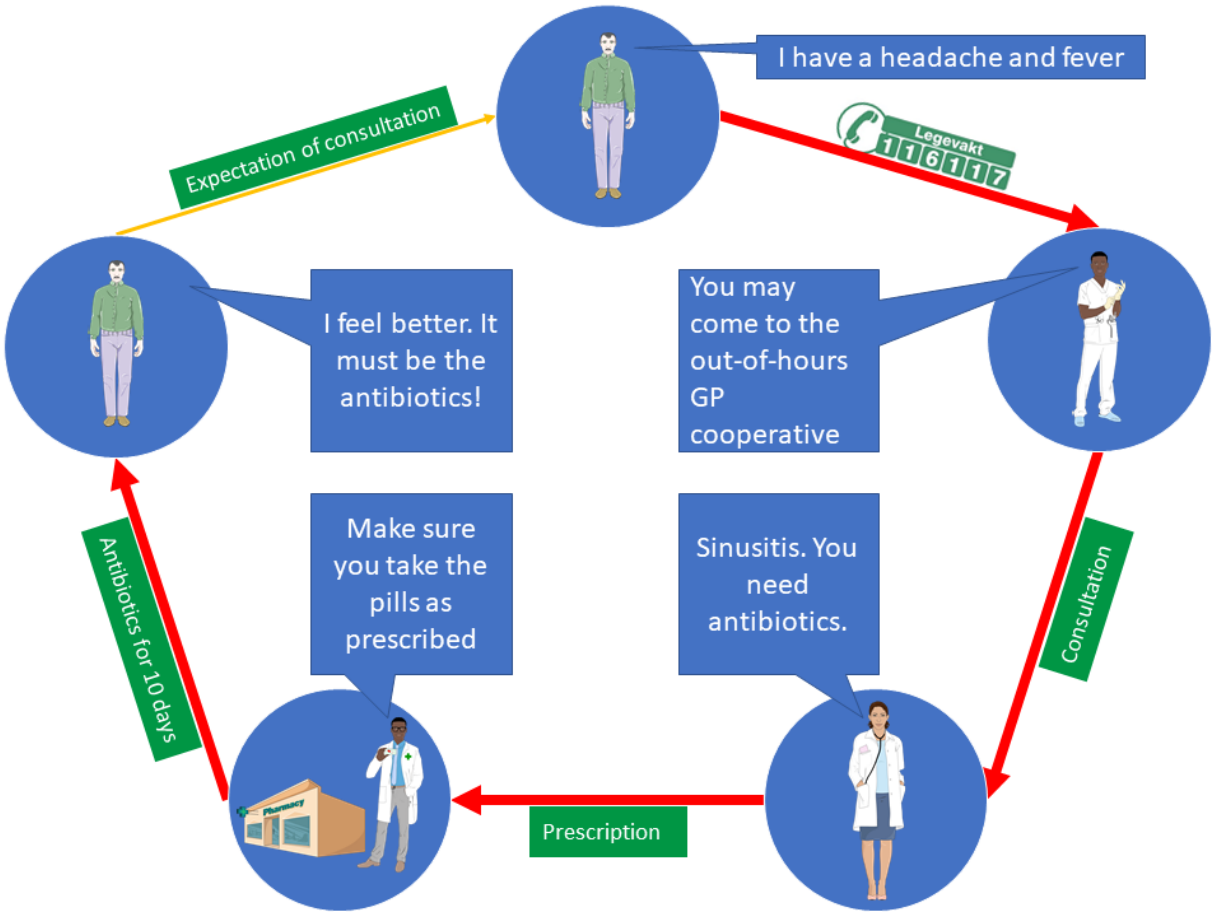

Figure 3 Out-of-hour chain of antibiotic consumption for sinusitis. (Images from smart.servier.com)

Studies on outpatient antibiotic prescribing for RTIs show that both patient-level and prescriber-level factors are associated with inappropriate prescribing (58).

1.6.1 Healthcare-seeking behaviour

As demonstrated in the classic paper "The Ecology of Medical Care" by White et al. and in "The Ecology of Medical Care Revisited" by Green et al., only a part of the population with symptoms will consult a medical doctor (59, 60). Very few will be admitted to a hospital (figure 5).

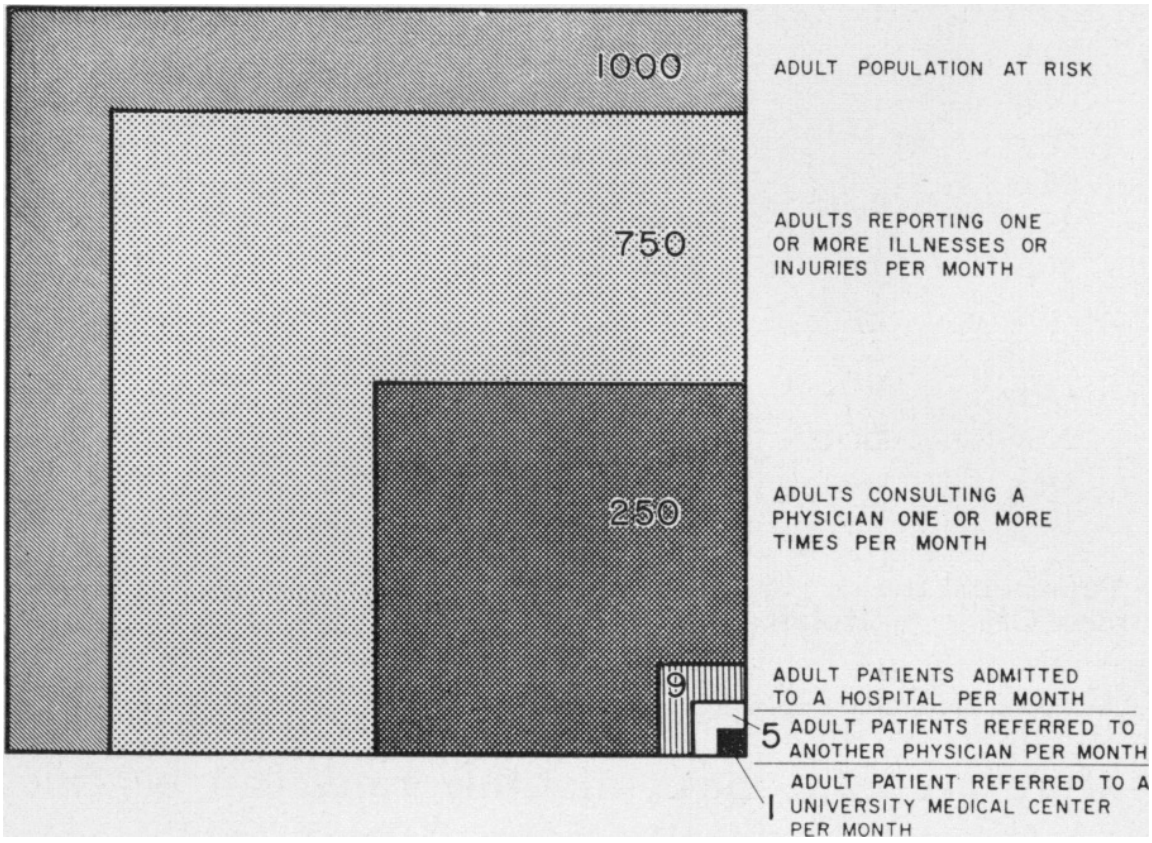

Figure 4 The Ecology of Medical Care. Reproduced with permission.
White KL et al. The Ecology of Medical Care. N Engl J Med, 1961 (59). Copyright Massachusetts Medical Society.

A more recent and delimited example of the ecology of medical care is the Tromsø population survey (61). The study found that 12.4 % of included subjects had

symptoms of an RTI during the last week, of whom only 5.1 % consulted a GP. The study did not investigate whether the GPs worked in-hour or out-of-hours.

The decision to seek healthcare is a complex process influenced by several non-clinical factors. Both personal, social, and cultural elements and characteristics of healthcare systems have been reported across different countries (62, 63). Social networks play an important role in health-seeking behaviour in general and in help-seeking behaviour for antibiotics in particular (64). There is also an association between general practice characteristics and the use of out-of-hours services (65). For instance, a short distance from GP practice to out-of-hours GP cooperative, low telephone accessibility and low GP availability for consultations seem to be associated with high use of out-of-hours services.

A challenge for primary healthcare may be the spirit of the age, expecting service 24/7. Young adults find the restricted opening hours of their GP offices too limited and seek help out-of-hours for convenience reasons (66). This tendency is probably reinforced if people perceive that their GP has a low capacity for urgent, same-day consultations (67). Unpleasant symptoms and needs that arise outside office hours are other important motives for contacting out-of-hours care (68).

Epidemics influence the number of people seeking healthcare and, consequently, the prescribing of antibiotics. The Norwegian epidemic of mycoplasma pneumonia in 2011/12 resulted in an increase in GP consultations and a peak in the sales of macrolides and tetracyclines (55, 69). The Covid-19 pandemic had the opposite effect, with a steep fall in the sales of antibiotics from March through December 2020 (55).

Antibiotic prescribing for RTIs declined in the United Kingdom during the last five years of the 20th century (70). This fall has been explained by a fall in the consultation rate for these conditions in the same period (71). A measure with the opposite effect was seen in Norway in 2016 (72). The government of the time introduced a sick leave certificate requirement for teenagers absent from upper secondary school for medical reasons. This requirement led to 30 % higher teenage consultation rates, with the highest increase for RTIs. Prescribed drugs increased by 8

%, mostly remedies for coughs and colds and antibiotics frequently used for RTIs. The study did not distinguish between consultations and prescribing in-hour or out-of-hours.

Healthcare itself may induce increased demand for its services. The Australian government introduced corporate entities to solve the problem of short-fall of out-of-hours services (73). The businesses advertised their services to the population. This led to high out-of-hours attendance at a considerable yearly cost for the government.

Demand may also be induced by healthcare personnel. Johnson describes physician-induced demand as a situation where a physician influences a patient's demand for healthcare against his interpretation of the patient's best interests (74). A fee-for-service plan for doctors may induce more consultations, as the doctors' income depends on the number of patients they see (75). However, on an individual level, it may be difficult to assess whether the patient or the physician has induced the consultation.

1.6.2 Telephone triage

An increasing number of countries have implemented telephone triage during the last decades to respond to the challenge of medically inappropriate use of the out-of-hours service (9). This has been done despite little evidence of the measure's effect, and although it is difficult to assess whether demand for out-of-hours healthcare has changed over time (76, 77).

Nurses perform telephone triage in most European countries. Denmark is the exception to the rule, where GPs perform telephone triage in four of five regions (78).

Telephone triage systems are made to identify and correctly handle high-urgency cases. A systematic review found that telephone triage on actual patients from unselected populations was safe in 97 % of all contacts with out-of-hours care (79). However, studies on nurses' performance in telephone triage are inconsistent, partly depending on what is measured and how it is measured (79-81). The appropriateness rate of advice varies between 44 and 98 % in different studies (81).

As part of the nurses' assessments of callers, triage scales are used in 90 % of the Norwegian local emergency medical communication centres (10). The remaining 10 % are in small districts, are generally less busy, and report that they seldom have conflicts of simultaneity.

There are several triage scales in use in Norway. The most used are the Norwegian Index of Emergency Medical Assistance, the Index of Norwegian out-of-hours services and Manchester Telephone Triage and Advice (82-84). All the triage scales use a colour system to display the triage, with only minor differences between the three. Manchester Telephone Triage and Advice will be used as an illustrative example (83). It has 53 charts that the healthcare personnel may use to assess callers based on what the caller reports as the problem. It is a reductive system, starting with the exclusion of life-threatening conditions (red triage), before high-urgency conditions (yellow triage), and ending with low-urgency (green triage). Each colour code gives a specified time limit for consultation with a doctor:

- Red colour: very high urgency, doctor's consultation recommended within 20 minutes
- Yellow colour: high urgency, doctors' consultation recommended within 1-4 hours depending on the callers' reported symptoms
- Green colour: low urgency, doctor's consultation recommended within 24 hours
- Blue colour: doctor's consultation is not necessary. Self-care recommended

To the best of our knowledge, how nurses handle telephone calls concerning RTIs with green codes has not been explored.

1.6.3 The prescriber

In a Norwegian setting, prescribing both in-hour and out-of-hours is primarily handled by list-holding GPs. However, the conditions and circumstances are different in the two settings, so comparing the two prescribing situations is pertinent.

A systematic review found that several physician-level factors associated with antibiotic prescribing had been discussed in different studies (58). The factors identified are listed with the number of studies revealing positive correlations:

- doctors' perception of patients' expectations (6 of 6)
- physician-rated severity of patients' illness (4 of 4)
- doctors' speciality (6 of 8)
- high-volume practice (1 of 3)
- International medical graduate (2 of 3)

Busy Norwegian list-holding GPs prescribe more and broader antibiotics than their less busy colleagues (44). Canadian high-volume practices were more likely to prescribe inappropriately (85). Hence, busyness seems to be a challenge in general practice worldwide, even though some studies do not find such a correlation (58, 86). There is, however, a knowledge gap on how busyness affects antibiotic prescribing in a primary care out-of-hours setting.

Norwegian data show remarkable variation in prescribing rates for RTIs on a municipality level, from 76 to 331 prescriptions per 1000 inhabitants (87). The difference is explained equally between the populations' consultation rates (the first link in the chain) and the GPs' prescription rates (the second link in the chain). The study did not distinguish between in-hour and out-of-hours prescribing.

Belgian GPs prescribed antibiotics in 23.7 % of all out-of-hours consultations, with a high rate for self-limiting infections and low rates of guideline-recommended antibiotics (88). In a qualitative study, the GPs reported a lower threshold for prescribing antibiotics out-of-hours than in-hour. They found the out-of-hours setting more insecure, with unknown patients and high time pressure (89). A video-elicitation study shows how the GPs tend to dichotomise their thinking into viral versus bacterial, antibiotics versus no antibiotics, and in this way, overshadow the patient's perspective (90). The authors discuss how this subconscious reasoning may increase antibiotic prescribing. A Canadian study highlights that the environmental context influences doctors' prescribing, especially when there is clinical uncertainty (91). Continuity of

care, as opposed to episodic care settings, seemed to be a positive moderator in reducing antibiotic prescribing. The researchers argue that interventions should emphasise clinicians' communication skills and ability to negotiate with patients rather than reminding them of antibiotic guidelines.

A Swedish study found only slightly higher prescribing out-of-hours than in-hour (47). The authors conclude that the slight difference was appropriate given the higher urgency of the epidemiology in the material compared to in-hour epidemiology. In England and Denmark, 15 % of all contacts in the out-of-hours service resulted in an antibiotic prescription, with a possible displacement of prescribing from in-hour to out-of-hours primary care in England (92, 93).

Based on existing evidence, there is reason to believe that episodic care, busy sessions, unknown patients, and higher urgency could lead to higher antibiotic prescribing out-of-hours compared to in-hour.

1.6.4 The consumer and the retailer

Antibiotics will not always be consumed as prescribed or for as long as recommended. This problem of non-compliance has been considered a predictor for the failure of treatment of RTIs (94). However, more recent studies have revealed that a shorter duration of treatment is effective, leading to fewer adverse effects, fewer superinfections and less selection of antibiotic resistance (95).

Delayed prescribing is a strategy that places the responsibility of the decision to consume antibiotics on the patient after an observational period. It has the potential to reduce antibiotic consumption as compared to an immediate strategy, and it seems to weaken people's belief in antibiotics for RTIs (96-98). A weakened belief in antibiotics may reduce the expectations for an antibiotic prescription, which in turn may reduce antibiotic prescribing in future primary care visits (58, 86).

The Norwegian law on retailing medicine is strict, allowing only pharmacists to handle prescriptions, and antibiotics can only be sold based on a prescription from a physician (99). This means that pharmacists play an essential information role that will

become even more important if the GP has used a delayed prescribing strategy. Shortening treatment duration may also increase the need for information from the pharmacist, as shorter cures may increase the necessity to follow the prescriber's advice more rigorously.

1.7 Quality improvement

As new knowledge emerges and old practices are rejected, healthcare services and their personnel must adapt. However, changing behaviours to improve performance is complex and challenging, even when there are good reasons for change.

Quality improvement collaboratives (QIC) as a way of improving practices evolved in the late 1980s (100). Using team meetings, audits, and feedback - applying the change and reporting back to the teams, has become the gold standard for interventions aiming to implement improvements in healthcare practice. There is good evidence to support the effectiveness of QICs, but the method's cost-effectiveness is still unclear (100). Essential components for favourable results are clear emphasis on important subjects, involvement of participants, facilitating reciprocal learning, using good data sources, setting clear goals, and preparing for continuous learning (101).

1.7.1 Quality improvement of antibiotic prescribing

Programs to reduce inappropriate antibiotic prescribing in primary care have often focused on changing GPs' behaviour in their own practice. A Cochrane overview of systematic reviews investigated interventions to reduce antibiotic prescribing in general practice (102). It found moderate-quality evidence indicating that using point-of-care C-reactive protein (CRP) and focusing on shared decision-making had a small but clinically relevant effect. The authors assessed the evidence from interventions on the education of clinicians and decision support as poor quality, and they could not conclude the effects.

A cluster-randomised controlled intervention that aimed to reduce antibiotic prescribing in Norwegian general practice was built on the principles from QICs. It involved participating GPs' in making focused goals and laying implementation plans, the GPs' data about prescribing habits were available, and several team meetings across different practices with visits from a peer academic detailer were held (45). The intervention made a statistically significant reduction in both antibiotic prescribing and the use of broad-spectrum antibiotics for acute RTIs. A separate arm of the study applied the same intervention to GPs working in the out-of-hours service of Trondheim (46). It led to a significant increase in prescribing the first-choice drug of penicillin V and a significant fall in prescribing macrolides.

Overall, evidence supports that interventions on the prescriber level are effective. However, a systematic review indicates that multifaceted interventions targeting the public and clinicians are most effective in reducing antibiotic prescribing in high-income countries (103).

1.7.2 Quality improvement of telephone triage

Good-quality telephone consultations increase the likelihood of appropriate decisions and urgency estimations (104). Dutch GPs believe strict triage and annual feedback to triage nurses could reduce the inappropriate use of out-of-hours GP cooperatives (34). An overview of systematic reviews suggests that telephone advice alone would be sufficient for more than half of all calls to telephone triage and advice systems (81). However, 77 % of incoming calls to the Norwegian out-of-hours service were assigned to GP consultations (17). Hence, quality improvement of telephone triage could ensure more efficient use of this part of primary healthcare.

Studies on quality improvement of telephone triage are generally performed in emergency departments. A review of reviews on the effectiveness of interventions to reduce emergency department utilisation concludes that the evidence remains insufficient (105). The authors found that the studies suffer from heterogeneous patient groups, unspecific target groups and a lack of control groups.

A Dutch study assessing the communication skills of out-of-hours triagists recommends that training should focus on patient-centred communication (106). Nurses in a Finnish emergency department improved their skills in evaluating patients' needs and health conditions via telephone triage after a training intervention (107). However, the study was quasi-experimental, and the results were based on self-reported questionnaires.

Hence, there is a knowledge gap on interventions aiming to strengthen the gatekeeping capacity of telephone triage nurses in primary care out-of-hours services. According to a Cochrane report, there is a need for more research assessing the effect of training interventions on the telephone consultation skills of healthcare personnel and the effect on patient outcomes (108).

1.8 Theoretical perspectives

The sociologist Ashley Crossman defines a theoretical perspective as "a set of assumptions about reality that inform the questions we ask and the kinds of answers we arrive at as a result" (109). In other words, a theoretical perspective is like looking through a lens to focus or distort what we see.

Studies from general practice may borrow theories from other areas, like sociology, because doctors, nurses, patients and healthcare all are part of society and because doctors, nurses and patients are thinking creatures (110). However, theoretical commitment differs between qualitative studies from general practice, and theory is more often used as a backdrop and inspiration than directly influencing the analysis of the empirical data (111).

A theoretically driven analysis is beyond the scope of this thesis, consisting of three different studies with three different methods. Two sociological theories may, however, shed light on the results and the discussions across the three papers.

1.8.1 Michael Lipsky's Street-level bureaucracy

Michael Lipsky is a former professor of political science at the Massachusetts Institute of Technology. He is now affiliated with the think-tank Demos, an organisation working for economic and democratic equity (110). He introduced the term "Street level bureaucracy" in his influential book, first published in 1980 and re-published in an expanded version in 2010 (112). Lipsky describes the dilemmas of the individual in public service, and he labels them street-level bureaucrats. He describes how they should simultaneously take care of citizens' needs and rights and protect public finance. He argues that their jobs will not be performed according to the highest standards because of a lack of time or resources. To balance the demands of the public and the state, the bureaucrats will use discretion in their work. In this way, they manage political decisions and priorities and influence politics.

The street-level bureaucracy theory has been widely discussed in different sciences like sociology and medicine. Lipsky wrote his theory after studies on social workers. However, research literature labels teachers, nurses, doctors, physiotherapists and even police officers as street-level bureaucrats (113).

1.8.2 Annemarie Mol's Logic of care

Annemarie Mol is a professor of political philosophy at the University of Twente in the Netherlands. In her book from 2006 (Dutch) / 2008 (English), she investigates what good care is (114). She asks whether defining patient autonomy as the highest value helps the patients. Her theory is written after field studies in a diabetes outpatient clinic, but it is convertible to other diagnoses and areas of healthcare (110).

Mol argues that choice has become a way of thinking and acting in Western societies in general and Western healthcare in particular (114). She uses the term logic from philosophy to describe what is and is not appropriate or logical to do in a situation or place (110). She claims that the logic of choice builds on a neoliberal view of health and society (114). This logic comes with an underlying assumption that

healthcare should follow patient demand. The logic of choice presupposes that humankind can make free choices in any situation and circumstance. It ignores the effect of maladies on this ability. She contrasts the logic of choice with the logic of care, asking if a suffering human really can make a free and good choice.

According to the logic of care, it is important to do good and to make life better (114). What this good is must be established along the way. It may be different between lives or in different moments in life. For suffering humans, healthcare personnel may explore different options in collaboration with the patients, enlightening the possible consequences of each choice. In doing so, they may exchange experiences, knowledge, suggestions, and words of comfort.

2 Aims of the thesis

The overall aim of this thesis is to explore and improve how Norwegian out-of-hours GP cooperatives handle RTIs.

The thesis comprises three studies, each with specific aims:

1. To assess antibiotic prescription rates and factors that correlate with antibiotic prescribing for RTIs in Norwegian out-of-hours GP cooperatives.
2. To explore how telephone triage nurses in Norwegian out-of-hours GP cooperatives assess callers with mild to moderate symptoms of RTIs.
3. To assess if an educational intervention for telephone triage nurses on RTIs may influence attendance for RTIs in out-of-hours GP cooperatives. Secondary aims: to assess the effect of the intervention on list-holding GP attendance and to describe the epidemiology of RTIs between list-holding GPs and out-of-hours GP cooperatives during three winter months.

3 Material and methods

The thesis comprises three studies with three methods: a retrospective data analysis, a focus group study, and an intervention study. The data source of the first study was the electronic patient record systems of the out-of-hours GP cooperatives in Hamar and Tønsberg. The participants in the focus group study were nurses from all parts of Norway working in out-of-hours services. The data of the intervention study was from electronic compensation claims from GP offices and out-of-hours GP cooperatives to the Norwegian Health Economics Administration, provided by the Norwegian Directory of Health (115).

3.1 Paper I – The retrospective data analysis

3.1.1 Research question

Which factors correlate with prescribing antibiotics and broad-spectrum antibiotics for RTIs in out-of-hours GP cooperatives?

3.1.2 Design

Retrospective data analysis of two out-of-hours GP cooperatives for the year 2014.

3.1.3 Main outcome measures

- Antibiotic prescription rates for RTIs
- Penicillin V prescription rate for RTIs
- Antibiotic broad-spectrum prescription rates for RTIs
- Factors correlating with prescribing of antibiotics and with broad-spectrum antibiotics

3.1.4 The setting and subjects

The out-of-hours GP cooperative of Hamar covered four municipalities and 80 000 inhabitants, and Tønsberg covered six municipalities and 90 000 inhabitants in 2014. One hundred twenty-eight physicians worked at least one shift that year. We contacted each doctor by e-mail and SMS to get permission to extract their data. 93 % agreed to participate in Tønsberg, and 97 % in Hamar. One doctor was excluded because of problems in extracting the prescription data. Hence, the material comprised data from one year's out-of-hours work of 121 physicians.

3.1.5 Ethics and data security

We used only data from doctors who gave informed consent to participate (see Appendix A). Due to its level of detail, the data material comprised information bound to professional secrecy before adapting to broader categories. The Regional Committee for Research Ethics (2015/398/REK sør-øst) gave consent to an exception from the professional secrecy to Bent Håkan Lindberg (BHL), in addition to co-authors Mats Foshaug and Svein Gjelstad (SG). All the data were kept on a password-protected computer belonging to the University of Oslo. The project was presented to the Norwegian Data Protection Authority (42185/3/LMR).

3.1.6 Data handling

Both out-of-hours GP cooperatives used the electronic patient record system Winmed2 (Winmed2. Profdoc AS, 2014). SG designed and programmed a specific software that could be used for data extraction through an online connection to the two respective servers.

For each participating GP, age, gender, speciality status (family medicine, yes or no), and date of each session in the cooperatives were retracted. For every consultation, irrespective of diagnoses, the exact time of opening and closing each patient's medical record was retrieved. As we did not have access to any of the two GP cooperatives' work schedules, we used the time data of each consultation to define

sessions and count the number of consultations per session. The opening of the first medical record was used as a proxy for the start of a session, and the closing of the last consecutive medical record was used as a proxy for the end of a session. An interval exceeding eight hours between the closing of a medical record and the opening of a new record defined the beginning of a new session.

Age and gender were registered and retrieved from every person who contacted the out-of-hours service. For RTI consultations, we also retrieved the diagnoses and grouped some according to clinical presentations and in line with former research (44-46). This gave the following groups, with ICPC-2 codes in parenthesis:

- Upper respiratory tract symptoms and infections (R01–05, 07–29, 74 and 80)
- Ear infections (H01, 71, 72 and 74)
- Acute tonsillitis (R72 and 76)
- Other RTIs' (R71, 77, 82 and 83)
- Acute sinusitis (R75)
- Acute bronchitis (R78)
- Pneumonia (R81)

For RTI consultations, antibiotics were retracted and grouped according to clinical indications and mechanisms of action:

- Penicillin V (J01CE)
- Penicillins with extended-spectrum (J01CA, J01CF)
- Macrolides and Lincosamides (J01FA, J01FF)
- Tetracyclines (J01AA)
- Others (J01)

For some of the analyses, we dichotomised antibiotics into

- Antibiotics prescribed or not prescribed
- Narrow spectrum (only Penicillin V) or broad spectrum (all other antibiotics)

As we wanted to investigate how busy doctors prescribe antibiotics out-of-hours, we used the exact time of opening and closing of medical records to build two proxies for busyness: median duration of consultations per session and median days between sessions. The first indicates how long the doctor spends per consultation in each session. We divided the sessions into quintiles based on this variable, independent of which doctor worked the sessions and which diagnoses had been used. The quintile with the shortest median duration of consultations comprised the busiest sessions. The second proxy indicated how many sessions each doctor worked on during a period. A low number of median days between duties meant that the doctor had worked many sessions during the time employed in the out-of-hours services. We divided the doctors into quintiles based on this variable. The quintile with the fewest days between sessions comprised the busiest doctors.

3.1.7 Statistics

SPSS (IBM ISPSS Statistics Data Editor Version 22 Armonk, NY) was used for the descriptive statistics. We used Stata (StataCorp. 2021. Stata Statistical Software: Release 14. College Station, TX: StataCorp LLC) to perform two binary multilevel regression analyses, where the dependent variables were

- Antibiotics prescribed or not prescribed
- Penicillin V or broad-spectrum antibiotics prescribed

and the independent variables were

- The two out-of-hours GP cooperatives
- The patients' gender and age groups
- The groups of diagnoses
- The doctors' age groups and speciality status
- The median duration of consultations per session
- Median days between sessions

The GPs were defined as clusters.

3.2 Paper II – The focus group study

3.2.1 Research questions

How do telephone triage nurses assess and counsel callers with RTIs? What are their views and experiences on this task?

3.2.2 Design

A qualitative study with data generated from four focus group interviews.

3.2.3 Participants and interviews

The focus groups comprised 22 participants, of whom five were men. They represented 13 different out-of-hours GP cooperatives serving a median population of 41 743 (22 205 – 76 649). The median experience of work as a telephone triage nurse was 7.5 years (1 – 22), and their median age was 42 years (24 – 66).

The first group was held in one specific out-of-hours GP cooperative in a county in Eastern Norway. We contacted the leader by e-mail and telephone, and five informants were recruited. Sigurd Høye (SH) moderated the interview, assisted by BHL.

The second and third groups were recruited from the participating list of the annual conference for primary care out-of-hours services in Norway [Den nasjonale legevaktkonferansen 2018] in September 2018. We aimed for diversity concerning gender, age, location, and population size served. A total of 32 potential participants were contacted by e-mail (Appendix B). We stopped recruitment when we reached 12 participants and performed two focus groups on two consecutive days during the conference. BHL moderated both, with the assistance of SH.

The fourth group was recruited, like the first, by e-mail to the leader of an out-of-hours GP cooperative in another county of Eastern Norway. The leader recruited four participants in addition to himself. The focus group interview was performed in the local out-of-hours GP cooperative with BHL as the sole moderator.

We followed an interview guide comprising four main themes (see Appendix C for the complete guide):

1. What are your general thoughts about telephone conversations concerning symptoms of RTIs?
2. Why do relatively healthy patients with mild symptoms get consultations in the out-of-hours setting?
3. What is your experience with nurse counselling of callers with RTIs?
4. Which factors encourage a strategy to wait for the opening of the list-holding GPs' office the next day? Which factors discourage such a strategy?

We formulated several subthemes under each main theme. We also wrote six scenarios in case of slow progress in the interviews. The interview guide was slightly moderated after interviews 1 and 3.

Each interview lasted between 75 and 90 minutes. The discussions were vivid in all the groups, and we did not need to use written scenarios. We encouraged the participants to engage freely in the discussions while ensuring that every informant was heard.

3.2.4 Ethics

All the participants received an information letter about the study before the interviews (Appendix D). The possibility to withdraw from the study at any time before publication was explicitly written.

The informants gave written consent to participate (Appendix D), and their anonymity was ensured throughout the data handling and publication.

The Regional Committee for Research ethics judged that the study could be carried out without ethical approval (2018/406 REK sør-øst B). The Norwegian Centre for Research Data approved data protection (58953/3/EPA). All data were kept on a password-protected computer belonging to the University of Oslo.

3.2.5 Background and preconceptions of the author

In qualitative studies, the researcher's preconceptions must be explained as part of the request for transparency (116, 117). As a GP for almost 20 years, I have worked many sessions in out-of-hours services. I have perceived the work as busy, at times, complex. On duty, I have regularly asked myself: Why has this patient been granted a consultation with me here and now? It was as if, though, I blamed the nurses for the busyness, considering it an easy task to identify and keep callers with mild to moderate symptoms of RTIs out of the out-of-hours service.

I have even worked sessions with hardly any patients, which meant I did not earn money. In such sessions, I have heard colleagues complain and ask the nurses for patients, so I assumed the informants would mention this pressure.

3.2.6 Analysis

BHL transcribed all the interviews verbatim and gave the informants fictitious names. The transcription process made the text familiar, facilitating the analytical work.

NVIVO 11 software (QRS International) was used for coding.

SH and BHL analysed the text according to systematic text condensation (STC), a method developed by Kirsti Malterud to aid novices in performing qualitative research in a structured and feasible way (116, 118). STC builds on Giorgi's phenomenological analysis. We followed STC's four steps.

The first step is to read the whole transcript to get an overall impression. SH and BHL read the text separately and identified several preliminary themes concerning RTIs and counselling of callers with this reason for encounter. We then met to discuss our findings and negotiated an agreement on five themes.

The second step is to identify and sort meaning units and establish codes. Meaning units are text fragments that contain information about the research question. This is opposed to Giorgi's method, where all the text is sorted in meaning units. For

this step, we identified meaning units concerning how the informants assessed callers with RTIs and the process of assigning these callers to consultations with doctors in the out-of-hours GP cooperative. Each meaning unit was coded and sorted into code groups related to preliminary themes from step one. At this point, the code groups were changed several times in an iterative process.

The third step is condensation, moving from codes to meaning. It implies systematically abstracting meaning units within each code group from the decontextualised empirical data and creating two to three subgroups under each code group. In STC, this step includes writing an artificial quotation that maintains the terminology of the participants. At this point in the analysis, we deviated from STC. Instead of creating artificial quotations, we wrote essential documents for each of the subgroups for condensation. This resembles the descriptions of the meaning units in Giorgi's method and has been used in several studies from the Institute of Health and Society, University of Oslo (119-121). It carries the essentials of STC's third step by condensing the material through the author's own words. Malterud approved the approach in Jan Frich's thesis (personal communication, Jan Frich 2022.06.14) (122).

The fourth step is to recontextualise through synthesizing the contents of the condensates. At this point, we wrote the story of the empirical material with an analytical approach, and the text describes the four result categories that emerged from the analysis.

Ingrid Keilegavlen Rebnord (IKR) read the descriptions from the synthesis first, then the transcripts. In this way, she controlled and ensured the quality of the analyses and interpretations.

3.3 Paper III – The educational intervention

3.3.1 Research question

Can an educational intervention for telephone triage nurses influence the number of RTI consultations in out-of-hours GP cooperatives?

3.3.2 Design

Pragmatic randomised controlled educational intervention.

3.3.3 Main outcome measure

The primary outcome measure was the change in the number of doctors' RTI consultations per 1000 inhabitants in out-of-hours GP cooperatives in the intervention group versus the control group for three winter months before and after the intervention.

3.3.4 Secondary outcome measures

The secondary outcome measure was the difference in the number of RTI consultations per 1000 inhabitants for three winter months in regular GP practices between the intervention and the control groups after the intervention. Another secondary outcome measure was to describe the distribution of RTIs at baseline in out-of-hours GP cooperative and GP practices for three winter months.

3.3.5 Participants and randomisation

We included all Norwegian out-of-hours GP cooperatives that met the following criteria:

- Serve a population larger than 10 000 inhabitants
- Recommend that the population call, as opposed to showing up, when they perceive a need for medical attention out-of-hour
- The local emergency medical communication centre is co-located with the clinic

- At least one nurse is present during the evenings
- Serves at least one whole municipality

Sixty-four cooperatives were included, serving 3.4 million inhabitants, i.e., 64% of the Norwegian population. Bergen's out-of-hours service was excluded because they recommended direct attendance until 2022. The median population size per out-of-hours GP cooperative was 36.048 (11 490 – 236 202). Randomisation was stratified by population size (small 10 000 – 40 000, large > 41 000) and performed in Microsoft Excel (2016) by an independent researcher.

Thirty-two out-of-hours GP cooperatives were randomised to the intervention group. Their leaders were invited to an information meeting during the annual leadership conference for primary care out-of-hours services in Norway (Lederkonferansen 2019) in March 2019 (Appendix E). Sixteen of the cooperatives were present. We introduced the educational intervention and explained how they could carry it out in their cooperatives without the three authors' support. BHL contacted the remaining 16 cooperatives and briefly gave the same information. A total of 31 cooperatives accepted the invitation to participate in the study.

3.3.6 The intervention

The intervention was made for nurses who assess callers to out-of-hours GP cooperatives. It comprised two parts, each of 90 minutes duration:

1. An e-learning course about RTIs and telephone communication skills
2. A group discussion about RTIs held in the local out-of-hours GP cooperative

BHL, IKR and SH wrote the e-learning course based on preliminary results from paper II. It was launched password-protected on the server of the National Centre for Emergency Primary Health Care Norway in October 2019 (123). Nurses in the intervention group exclusively received the password. The e-learning course had the following headings and themes (ref. Paper III; supplementary appendix A):

- How does the population use out-of-hours service?
    - RTIs in GP offices
    - RTIs in out-of-hours GP cooperatives
- About RTIs
    - Limitations of triage tools
    - Anatomy of the respiratory tract
    - Signs of RTIs
    - Self-limiting RTIs
    - The effect of antibiotics
    - When are RTIs high-urgency cases?
- Emergency medicine versus infectious medicine
    - Fever in adults and children
    - General condition
- Possible actions for RTIs
    - Time as the most important curative factor
    - Antibiotics and unwanted effects
    - Prescription free drugs
- The role of telephone triage nurses
    - The many tasks of a nurse
    - The right level of care
    - The toolbox of measures
    - Busyness
- Clarifying the reason for the encounter
    - Different approaches
    - Patient centred approach
- Communication and negotiations
    - The significance of patient-centred communication
    - Professionalism and assessments
- How to make security nests
    - About security nesting
    - Difficult conversations

The e-learning course was interactive, with cases, questions and answers and active participation.

For the group discussions, BHL and SH prepared individual reports comprising statistics on how the population used each out-of-hours GP cooperative and the list-holding GPs in the corresponding municipalities for RTIs (figure 5) (Appendix F).

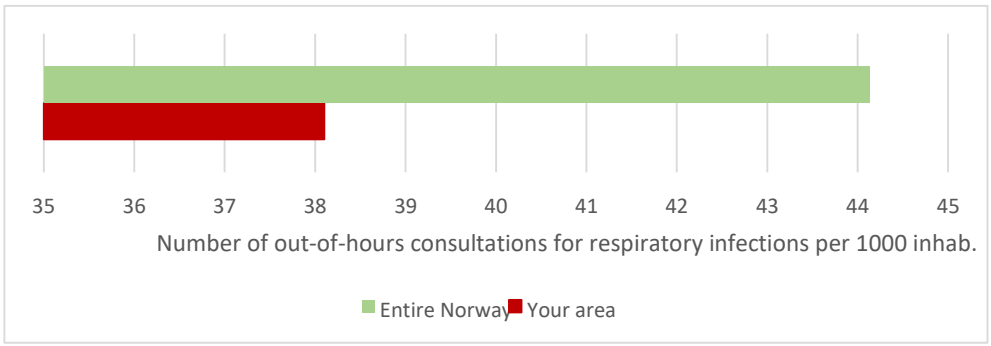

Figure 5: Example of figure from the report for Bodø out-of-hours GP cooperative

Data for the reports were retrieved from the Norwegian Control and Payment of Health Reimbursement Registry's open database*. The reports included questions for group reflection and discussions, like

- How do you assess the cooperation between list-holding GPs and the out-of-hours GP cooperative in your area?
- How is the distribution of diagnoses in your out-of-hours GP cooperative compared to the rest of the country?
- How are telephone consultations used in your out-of-hours GP cooperative?

We also wrote an explanatory, short text for the local leaders on how to use the reports to ensure intendedly use (Appendix G). The cooperatives in the intervention group received the reports by mail and e-mail, and they were encouraged to carry through the educational activities before December 2019.

* Lindberg BH, Høye S. Own report. [Raw data fetched from the KUHR-database 19.05.2019 at https://opne-data.helserefusjon.no/]. Oslo: Helsedirektoratet [The Norwegian Directorate of Health]; 2019.

The intervention was made with an intention-to-treat design. This design implicated that all the invited cooperatives who accepted to participate were included in all analyses, independent of whether they had completed the educational activities. It also implicated that we did not have any follow-up on the implementation of the intervention.

The server of the National Centre for Emergency Primary Health Care registered how many nurses had started or completed the e-learning course each month through the log-on function of the website (123).

3.3.7 Data handling

The National Centre for Emergency Primary Health Care provided data on which municipalities each out-of-hours GP cooperative served. Population statistics about the municipalities were retrieved from Statistics Norway (124).

Some municipalities merged across the two groups during the study period (figure 6). Consequently, data from Sørum and Røyken & Hurum GP cooperatives and Asker municipality were excluded. These exclusions constituted 79 786 inhabitants in the control group and 32 156 in the intervention group. Data error forced us to exclude data from Kristiansand’s and Orkdal's out-of-hours cooperatives (serving a total of 180,989 inhabitants) in the control group.

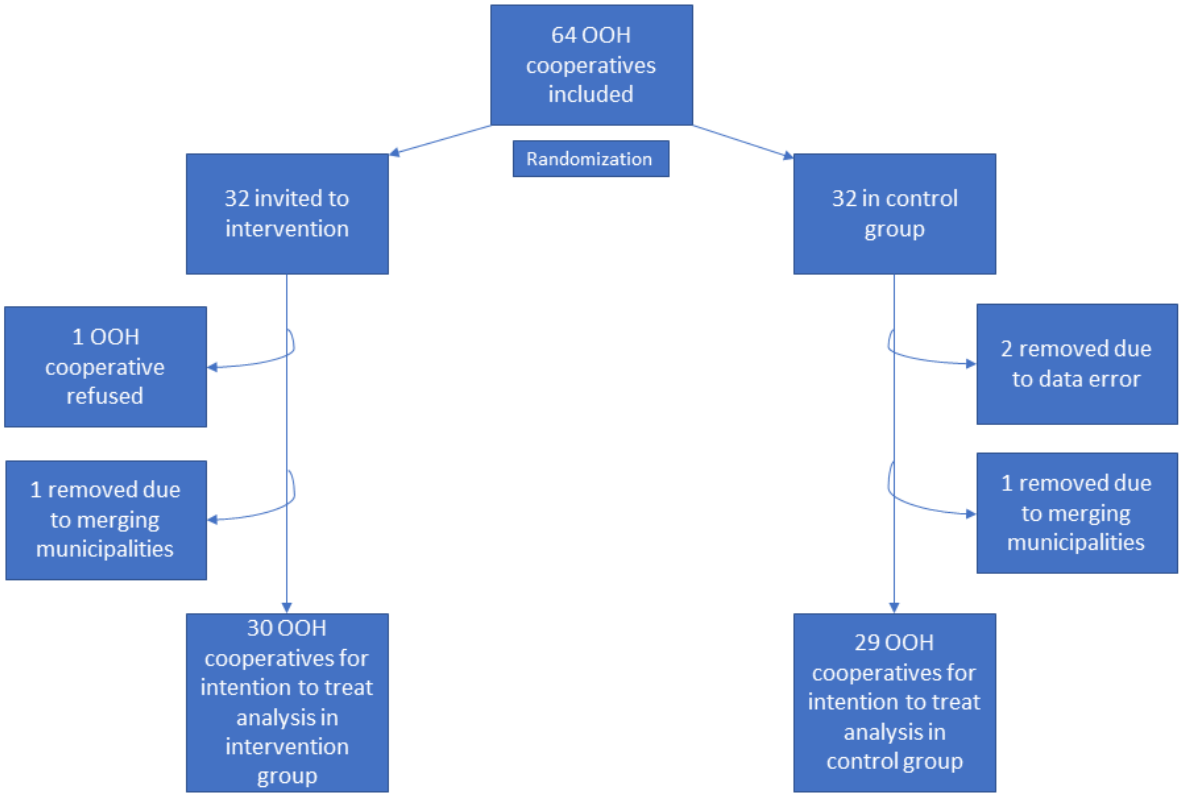

Figure 6: Flow chart of out-of-hours GP cooperatives included and reasons for exclusion after randomization.

List-holding GPs and out-of-hours GP cooperatives send electronic compensation claims to the Norwegian Health Economics Administration based on their clinical activity and regardless of how the GPs are compensated for their work (115). These claims contain data on contact date and type with the health services, whether the contact was through telephone, consultation, or home visit, in addition to patient age, gender and ICPC-2 diagnoses. The National Directory of Health delivered these data for out-of-hours GP cooperatives and list-holding GPs in all the included municipalities, comprising 13 404 573 contacts (115).

In principle, doctors can set as many ICPC-2 codes as they want on each electronic compensation claim. We found 25 885 contacts (0.17 % of all contacts) with more than five codes in our data material. The likelihood of something wrong with these claims is so high that we decided to delete them from the material.

We defined RTIs according to ICPC-2, mainly in line with former research, but slightly moderated from paper I (44-46): “respiratory symptoms” (R01–05, R08–09,

R21 and R23–29), acute tonsillitis (R72 and 76), acute RTIs (R74), acute sinusitis (R75), acute laryngitis (R77), acute bronchitis (R78), influenza (R80), pneumonia (R81–82), “other RTIs” (R71, R83 and R99) and ear infections (H01, H29, H70–72 and H74). We also defined the groups urinary tract infections (U01–02, U07, U13 and U70–72), “other conditions” (A03, A76–78), “unspecified” (A99) and “all other diagnoses” (all other ICPC-2).

For the contacts with several codes (less than six), we merged and kept diagnoses according to the following priorities:

1. R71-72, R74, R76-78, R80-83, R99, H01, H29, H70-72, H74
2. R01–05, R08–09, R21 and R23–29
3. U01, U02, U07, U13, U70-72, A03, A76-78
4. All ICPC-2 codes not mentioned above except A99
5. A99

When there was conflict within each of the five priority groups, the first code mentioned on the specific claim was kept as the primary diagnosis.

3.3.8 Ethics and data security

The local leaders decided whether their cooperative would participate. As the educational intervention was based on existing guidelines, we judged it ethical just to let the leaders consent to participate on behalf of the nurses.

An intervention to keep people away from doctors’ appointments may create an ethical dilemma. However, the goal was to make the participants more confident in separating urgent and less urgent cases. In this way, the callers’ safety should improve, allowing less urgent cases to stay home in a safe and comfortable environment.

The Regional Committee for Research ethics assessed that the study did not need ethical approval (2018/1080/REK sør-øst C).

All data were anonymous and kept on a password-protected computer belonging to the University of Oslo. The Norwegian Centre for Research Data approved data protection (542881).

3.3.9 Statistics

We had no access to the number of nurses working in each cooperative nor how many of them had participated in the group meetings. We compensated for this weakness by creating a participation proxy. The proxy was made by the number of nurses per 1000 inhabitants in each out-of-hours GP cooperative who had started or completed the e-learning course.

Microsoft Excel (2016) was used to obtain frequencies and percentages to describe the distribution of the populations and diagnostic data in the two groups.

For the statistical analysis, we used StataSE 17 (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC).

Poisson regression is usually the model of choice for count data. However, our data failed to satisfy the equi-dispersion assumption, which states that the distributional mean should be equal to the variance. Therefore, we extended the Poisson model and used the negative binomial regression model, with random effects at the level of out-of-hours GP cooperatives, to check for any differences in the baseline number of consultations between the two groups and for the primary and secondary outcomes. The model was adjusted for the participation proxy, the population size and patients' age groups.

4 Summary of results

4.1 Paper I – The retrospective data analysis

Lindberg BH, Gjelstad S, Foshaug M, Hoye S.

Antibiotic prescribing for acute respiratory tract infections in Norwegian primary care out-of-hours service.

Scand J Prim Health Care. 2017;35(2):178-85

The paper aimed to examine factors correlating with narrow and broad-spectrum antibiotic prescribing for RTIs in two out-of-hours GP cooperatives in 2014.

The median number of sessions per doctor was 11, with a median duration of consultations of 12 minutes. RTI consultations had a median duration of 11.5 minutes.

We found that antibiotics were prescribed in 14.7 % of all consultations and 34.2 % of all RTI consultations. 69.9 % of RTIs received penicillin V, and 13.4 % received macrolides.

Antibiotics were prescribed in 80.3 % of all cases of acute tonsillitis and 75.9 % of all cases of acute sinusitis. Ear infections (57.3 %) and acute bronchitis (40.3 %) also had high prescription rates.

Multilevel logistic regression analysis revealed that children and older people had the lowest odds ratio of receiving antibiotics. The diagnoses of acute tonsillitis and acute sinusitis had the highest odds ratio of receiving antibiotics.

Doctors' gender, speciality status (family medicine) and frequency of sessions did not correlate with antibiotic prescribing. Antibiotic prescribing increased with increasing busyness measured as the median duration of consultations per session. The busiest quintile of sessions had an odds ratio of 1.38 (1.06-1.80) for antibiotic prescribing compared to the least busy sessions. There was no correlation between busy sessions and prescribing of broad-spectrum antibiotics.

4.2 Paper II – The focus group study

Lindberg BH, Rebnord IK, Høye S.

Phone triage nurses' assessment of respiratory tract infections – the tightrope walk between gatekeeping and service providing. A qualitative study.

Scand J Prim Health Care. 2021;39(2):139-47

The paper aimed to explore how telephone triage nurses assess callers with symptoms of RTIs and their views and experiences on this task.

The informants described a de facto gatekeeping function on behalf of the out-of-hours GP cooperatives. Nevertheless, they chose the term service provider to describe their role and were reluctant to call themselves gatekeepers.

The nurses negotiated and used strategies to reach a consensus with the callers when they judged it safe to wait home and not have a doctor's appointment in the out-of-hours GP cooperative. One of these strategies was to appear confident and convincing. Other strategies were to use the green triage as an argument and refer to guidelines or clinical knowledge.

The participants in all the focus groups discussed how structural factors influence the population's use of out-of-hours GP cooperatives. The fee-for-service payment of out-of-hours doctors was described as a push factor for more consultations. They also discussed how long telephone queues lead to a vicious circle of less telephone counselling and more consultations in the out-of-hours GP cooperative.

The informants described characteristics of individuals or groups as factors that considerably influence the use of out-of-hours services. They discussed how many callers cannot distinguish between severe and uncomplicated RTIs, and believe antibiotics have a swift and pain-killing effect. They also talked about how former experience with recovery during antibiotic treatment for similar symptoms increases the expectancy of a consultation in the out-of-hours GP cooperative.

4.3 Paper III – The educational intervention

Lindberg BH, Rebnord IK, Høye S.

Effect of an educational intervention for telephone triage nurses on out-of-hours attendance: a pragmatic randomised controlled study.

Accepted for publication in BMC Health Services Research

The study's primary aim was to assess the effect of an educational intervention about RTIs for telephone triage nurses on out-of-hours attendance. The secondary aims were to describe the distribution of RTIs at baseline in out-of-hours GP cooperatives and GP practices for three winter months and to assess whether the educational intervention influenced list-holding GP attendance.

There was no difference in the number of consultations between the two groups of out-of-hours GP cooperatives after the intervention. For RTI consultations, the negative binomial regression model estimated an incidence rate ratio of 0.99 (0.91-1.07, 95 % confidence interval, ref. control) in out-of-hours GP cooperatives and 1.00 (0.94-1.06, 95 % confidence interval, ref. control) for list-holding GPs.

Even for telephone consultations, there was no difference between the two groups after the intervention, neither for out-of-hours GP cooperatives nor for list-holding GPs.

Attendance of children under five in the out-of-hours GP cooperatives was relatively higher than for list-holding GPs, for all diagnoses (14.5 % vs 4.7 %) and RTIs (34.4 % vs 16.5 %).

More than 50 % of all cases of laryngitis were diagnosed out-of-hour, while the proportion of tonsillitis was 25.2 %, pneumonia 22.5 % and urinary tract infections 20.1 %. Upper RTIs and symptoms of RTIs were the two most frequently used groups of RTI diagnoses in the out-of-hours GP cooperatives.

5 Discussion

5.1 Methodological considerations

5.1.1 Overall considerations on the multi-methods design

This thesis has used three different methods, two quantitative and one qualitative. The results from the retrospective data analysis made us ask: Why do sessions get busy? Secondly: What is the role of telephone triage nurses in this busyness? Moreover, how do they assess callers with RTIs? We conducted a focus group study among telephone triage nurses to answer these questions. Thirdly, the finding of a correlation between busy sessions and antibiotic prescribing made us ask: Can we do something about busy sessions? To answer this question, we tested whether out-of-hours attendance for RTIs could be influenced through an educational intervention for telephone triage nurses. The intervention was largely developed from the results of the focus group study and met the need for education on RTIs, as discussed among the informants.

Papers I and III investigate how a population with RTIs use out-of-hours GP cooperatives at different time points (figure 7). Paper I is a retrospective study aiming to identify risk factors for the outcome of antibiotic prescribing among those who are exposed to a doctor's consultation. Paper III is an experimental study aiming to investigate if it is possible to restrain the exposure of a doctor's consultation for the population under study. Paper II explores how nurses perceive their work when assessing the RTI population and deciding which callers should be exposed to a doctor's consultation and which can wait for their GP or stay home. The intervention of paper III was informed by paper II.

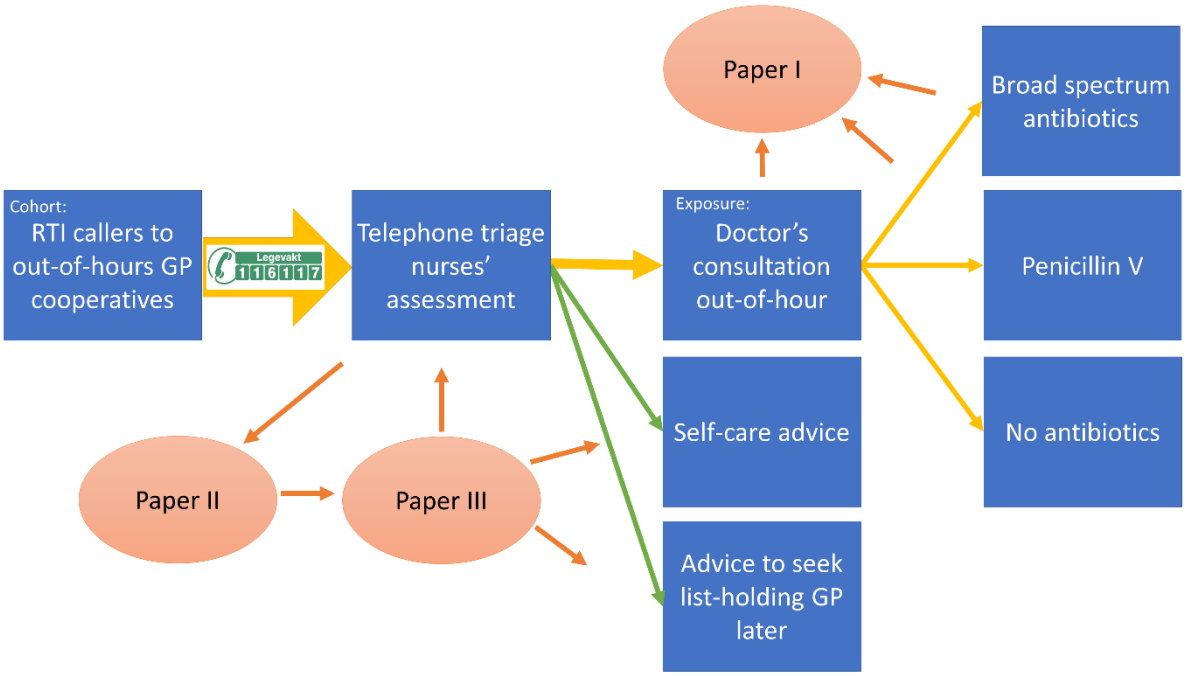

Figure 7 Paper I-III and their inter-relations.

Using different methods from different epistemological traditions is often labelled triangulation or mixed methods (125, 126). However, triangulation has its source in the qualitative research literature, where it is used as a quality check to see if methods with different strengths and weaknesses support a single conclusion (117). Moreover, mixed methods presupposes that qualitative and quantitative data collections and analyses are integrated into a single study (125). Due to the design of one method per paper, I prefer to use the term multi-methods design for the approach in this thesis.

The multi-methods design within a thesis has some of the same advantages as mixed methods. It combines the power of stories and numbers, making it possible to gain information about different, and often diverging, aspects of the phenomenon of interest, thus creating a more complex understanding (117, 125). This approach is pertinent for general practice because its clinical work and research are complex, drawing on diverse scientific fields (127). Physical and telephone consultations are encounters between humans where cultural and social interactions occur, not merely an exchange of medical information. Hence, the interpretative paradigm of qualitative research is the most appropriate for analysing what happens during these meetings,

supplementing information from studies based on biomedical epistemology and theory (110).

A weakness of multi-methods design in a thesis is that the breadth may impair in-depth methodological expertise, as each paper demands new knowledge and skills. However, the increasing complexity of medical research almost always demands collaboration with experts in different fields. Hence, any lack of in-depth methodological expertise may be compensated by collaboration skills and a network of researchers and statisticians acquired through each project.

5.1.2 Overall considerations on reliability and validity

In research, the aim is to give the most valid estimate possible for a measurement (128). Systematic or random error can affect any measurement or registration, meaning the measured value deviates from the variable's true value (128, 129).

Random errors remain when systematic errors are removed, and they occur when there is variability in the data that cannot be readily explained (130). The absence of random error is referred to as precision or reliability. Statistical variation measurements, like confidence intervals, show the probability of random errors. The models used in paper I have relatively wide confidence intervals on several analyses, indicating that the estimates are subject to random errors. The wide confidence intervals could be due to the relatively small number of observations included. In paper III, there is a much larger number of observations, and the confidence intervals are narrow. The narrow confidence intervals mean that the statistical calculations give a relatively precise estimate of the "real" effect of the intervention, indicating a low probability of random errors, hence high reliability.

The term systematic error means that the measurements always differ from the true value in a certain direction (128). Another term for systematic error is bias. Bias weakens a study's validity and may lead to inaccurate conclusions.

Bias may be present in three ways in epidemiologic studies; information bias/misclassification, selection bias and confounding (130). This section will give some overall considerations about information bias before discussing papers I through III.

Coding with ICPC has been mandatory for Norwegian GPs since 1992 (131). ICPC-2 replaced ICPC-1 in 2004 (39). ICPC-2 is widely used in primary care research, as it is a feasible approach for assessing quality indicators such as antibiotic prescribing. Concern has been raised regarding the use of ICPC-2 for research purposes. Some have even questioned whether ICPC is appropriate for classifying clinical practice in primary care (131). Diagnostic coding has been discussed as an arbitrary process for respiratory tract infections, partly to justify antibiotic prescribing (132). Even though a small Norwegian study found that the text in electronic patient records corresponds with the ICPC codes used, the problem of ICPC misclassification bias is yet to be clarified (133).

One reason for the misclassification of ICPC-2 codes may be that some software programs for electronic patient records available in Norwegian out-of-hours services demand an ICPC-2 code for administrative reasons before the GP has finished the diagnostic process. In such cases, a symptom diagnosis may be used temporarily. If the GP later forgets to code according to the final assessment, the symptom code remains the only code for the consultation. Antibiotic prescribing is then falsely related to a symptom diagnosis, and we could underestimate the antibiotic prescription rate for respiratory tract infections. We do not know the extent of this problem. However, the finding in paper I of an antibiotic prescription rate of 18.9 % of consultations coded with symptom diagnoses could indicate a combination of misclassification and inappropriate prescribing.

In papers I and III, RTIs were grouped based on their clinical similarities. The grouping in paper I was in line with former Norwegian studies (44). A problem with this grouping is that all the symptom codes are categorised together. For instance, R05 (cough) could just as well be grouped with R78 bronchitis, and R21 (symptoms from the throat) could have been grouped with R72/76 (tonsillitis). However, our choice of

categories enabled comparison across studies. In addition, assessment of the appropriateness of antibiotic prescribing became more straightforward, as we assume that most symptom diagnoses are coded as such in lack of sure signs of infection.

For paper III, we slightly changed the grouping of diagnoses. We kept R74 (cold) and R80 (influenza) as single diagnoses and merged R82 (pleuritis) with R81(pneumonia) to pneumonia. The first change was to increase the level of detail for a better description of the epidemiology of the out-of-hours service. The second change was due to our conception of R82 (pleuritis) as a label often used for clinical findings that cannot be separated from R81 (pneumonia). This conception may be wrong, but R82 appeared in only 0.01 % of all the baseline codes and 2 % of all consultations for the combined R81/R82 group. It is, therefore, unlikely that it has influenced any of our findings or conclusions.

5.1.3 Paper I - The retrospective data analysis

Paper I aims to identify factors associated with antibiotic prescribing to patients with RTIs in out-of-hours GP cooperatives. The two included cooperatives are relatively large in a Norwegian setting, and more than 90 % of the doctors agreed to deliver their data.

Both out-of-hours GP cooperatives' electronic patient record system was Winmed2 in 2014 (Winmed2. Profdoc AS; 2014). The software was programmed and designed as a tool for the clinician to write continuous medical records and not as a data source for research. However, it automatically registered data useful for research through everyday clinical use. The software's statistical package was neither sufficient nor reliable to retrieve these data. SG, therefore, designed and programmed a specific software that could be used for the study purpose through an online connection. This implied that we could extract data without any mediator, providing a good overview of the activity documented in the electronic patient records for the two cooperatives in 2014.

However, several validity threats can be identified. The first is selection bias, which may threaten external validity. Two out-of-hours GP cooperatives are limited, serving only 3.31 % of the Norwegian population. Our findings could be due to local culture or practices restricted to these two cooperatives only. However, they are located in two different counties and had no formal or informal cooperation at the time of the study. Hence, they may be considered representative for cooperatives of about the same size. We believe the findings may be generalised to out-of-hours GP cooperatives where busy sessions are a common challenge, especially where the GPs have a fee-for-service payment.

The second validity threat is bias by confounding. Confounding may be defined as the confusion of effects, meaning that the effect of the exposure is mixed with the effect of another variable (130). We sought to correct for confounding by using a multilevel logistic regression model, where we included the potential and available variables that could explain the outcome of antibiotic prescribing. We could have chosen stratification as an alternative strategy to control for confounding. In that case, age groups or gender could be possible strata. However, stratification by age groups or gender would reduce the study's power, as it would implicate subgroup analyses. In addition, there is no reason to believe that busyness has a different effect on the outcome in different age groups or genders.

The risk of confounding was especially related to the variable busyness. We did not have access to work schedules, meaning we had to build two proxies for busyness: median duration of consultations per session and median days between sessions, as described previously. The way the variable median duration of consultations was constructed presupposes that the doctor works without pauses on each session, as short consultations with pauses in between still would be registered as busyness. This is a weakness not possible to control for in the regression model given the available data, and it could mean that the observed correlation between busy sessions and antibiotic prescribing is flawed. However, broad, practical experience from out-of-hours GP cooperatives indicates pauses are far from reality. The doctors know that the queue increases for every new patient on the time sheet. The only option to increase the

capacity is to work faster, i.e., shorten the time spent per consultation. This supports the assumption that a short median time per consultation is a valid proxy for busy sessions.

Another possible confounder for busyness is that RTIs may sometimes demand only short consultations in addition to antibiotic treatment. It could mean that the observed correlation between busy sessions and antibiotic prescribing is due to consultations with many RTI patients because time spent on these may be lower than for patients with other diagnoses. However, the proxy for busy sessions draws on consultations for all diagnoses from the whole year. Therefore, it is unlikely that the whole quintile of the busiest sessions is dominated by “easy-to-resolve” consultations of uncomplicated respiratory tract infections. We also checked for confounding by diagnoses by including RTI diagnoses in the regression model.

The problem of missing data occurs in all study designs in primary care research (134). It can be defined as data that could have contributed to the analyses but are unavailable to the researcher. Missing data in terms of misclassification has already been discussed in chapter 6.1.3. The consultations of doctors who refused to deliver their data to the project constitute a source of missing data in the study. However, their share of the overall data is small, and we believe that the possible bias and validity threats due to these missing data are of minor importance. One of the doctors only used paper prescriptions, so we could not retract the prescription data. There is reason to believe that these data would be valuable to the analyses but hardly decisive of any of the conclusions.

None of the included doctors was aware of the planned research project when they created the data through their clinical activity in 2014. So, despite the somewhat surprising finding of a very high rate of penicillin V, an observed Hawthorn effect is unlikely (135).

5.1.4 Paper II – the focus group study

Whether the concept of validity should be utilised in qualitative research is under debate (117). Some researchers argue that the notion is too closely linked to quantitative methods and is incompatible with a constructivist approach. They deny that there is a “real world” outside the constructs of individuals and societies. I choose to rely on Maxwell's realist approach, using validity in the meaning of correctness or credibility of a description, conclusion, explanation, interpretation, or other sorts of account.

Malterud claims that focus group interviews are suitable for exploring experiences, attitudes or views in environments where many interact (116). The challenge is that the discussions may become so vivid that it is hard to follow for the moderator and may complicate the transcription and its interpretation. Both SH and BHL were present in three of four interviews. The discussions in the fourth were vivid but easy to follow. Hence, we believe that our choice of focus groups was fitting, considering the research questions and the environment in which the informants work.

A key question for validity is how one might be wrong, i.e., what are the validity threats to the research performed? Several qualitative research checklists aim to ensure quality and make validity threats transparently discussed (136-138). Maxwell has developed a list of strategies that can test the validity of a study’s conclusion and the existence of potential threats to those conclusions (117):

- Researcher bias
- Reactivity
- Intensive, long-term involvement
- Rich data
- Respondent validation
- Intervention
- Searching for discrepant evidence and negative cases
- Triangulation
- Numbers

- Comparison

The goal of qualitative research is never that of a neutral researcher but of transparency on how the researcher's conceptions have influenced the conduction and conclusions of the study. Researcher bias is data selection according to the researcher's perception of the theme under study (108). Reactivity is the influence of the researchers or the interview situation on the interviewees. The two interviewers' role as medical doctors and researchers on RTIs and antibiotic prescribing has probably induced reactivity that is hard to discern. We have tried to meet this validity threat by actively looking for answers that oppose our preconceptions and by including Ivan Spehar, with a health and social psychology background, in the analytical process.

Our backgrounds as GPs, working many sessions in out-of-hours GP cooperatives, have certainly formed our preconceptions. We have often perceived sessions as busy, observing that many patients with RTIs were only mildly or moderately ill. We thought it would be an easy task to keep these people from consultations out-of-hour and set out to explore why the nurses could not. The findings in paper II opposed our preconceptions, pointing at a reality much more complex than we had anticipated. This is an indication of low to moderate reactivity.

There is always a risk that interviews reveal what the informants think is the right thing to do rather than what they do. Long-term involvement with participant observation would have increased the validity of our results and conclusions (117). However, this was not feasible in our multi-methods design within the frame of a PhD programme, and the focus groups revealed unwanted practices and conflicts between nurses and doctors. We believe this indicates an insight into practice, not only into conceptions of practice.

Maxwell shows how intensive interviews indicate rich data (117). We perceived all the interviews as intensive. The verbatim transcription of all the interviews was lengthy but feasible to analyse, indicating rich data that could be handled without the thousand-page problem (116, 117). However, we chose to use Malterud's notion of information power as guidance, as this is concrete, making it easier to assess the

number of informants needed and the data quality (139). Our study aim was relatively narrow, and the sample specificity was dense. We perceived that there was a strong quality of the dialogues in the focus groups. All these three elements indicate high information power. However, the choice of a cross-case as opposed to an in-depth analysis, in addition to the use of “Street-level bureaucracy” as a backdrop rather than applied theory, could indicate low information power and a need for more informants. We partly compensated for this by having as much as 22 informants and four focus group interviews. In sum, we judged that we had enough information power to answer the research questions.

We did not ask for respondent validation. This is a weakness that increases the risk of misunderstandings and researcher bias. Therefore, we searched for someone who could challenge our conceptions. Lene Lunde, nurse and PhD-student, read the manuscript, looking for possible flaws from a nurse's point of view. She had a few minor suggestions that we followed.

Maxwell’s intervention strategy is less pertinent in our study, as we interviewed all informants only once.

Malterud and Maxwell suggest that researchers look for discrepancies and negative cases (116, 117). We tried to be sensitive to disagreements throughout the four interviews and the analytical process. Where we found disagreements and divergent voices, we have reported them in the result section of the paper. In one of the local groups, the leader of the out-of-hours cooperative participated as an informant in the focus group. This participation was not intended and could imply a weakening of local conflicts revelation and negative cases during the interview. However, the conception of the group discussion was that of an open and friendly tone where disagreements were discussed.

Whether statements and opinions should be reported with the number of informants is controversial in qualitative research. Maxwell claims that reporting on numbers makes the semiquantitative statements more precise (117). Malterud has a different point of view, claiming that numbers may give a false impression of statistical power (116). We followed Malterud in this study and have reported “some”,

"a few", etc. For instance, we wrote, "Some of the informants described a constant uncertainty concerning their own assessment of callers". We did not include any numbers apart from the overview of the participants. According to Maxwell, this is a weakness that could negatively influence internal generalisability.

We did not use the strategy of comparison. However, the informants were from different parts of Norway, as well as from different-sized out-of-hours services. Any lack of confidence among the participants in the mixed groups was probably compensated for in the two local groups. Possible internal culture in the local groups was probably compensated for in the mixed groups. This has ensured diversity between the groups. It also increases generalizability within the larger group of telephone triage nurses working in Norwegian out-of-hours GP cooperatives (117).

The two mixed focus groups comprised experienced nurses, of whom several worked with professional development in their out-of-hours GP cooperative. There is, therefore, a risk of selection bias in these groups. However, the two groups of local nurses comprised both experienced and relatively fresh nurses. Therefore, the risk of such bias in the material is relatively low.

5.1.5 Paper III – the educational intervention

Paper III describes a pragmatic, randomised, controlled educational intervention. The 59 out-of-hours GP cooperatives in the study serve 3.12 million inhabitants, i.e., 59 % of the Norwegian population. Thus, the sample size is large and includes all the cooperatives that met our inclusion criteria except those excluded, as mentioned in chapter 4.3.7. We did not make power calculations, as any power issues would implicate that the study needed to be extended beyond Norway. For the same reason, the external validity should be high, at least in health services in comparable countries and settings.

A pragmatic trial investigates whether an intervention works in a clinical setting on all types of patients, and it seeks to answer questions about how an intervention can be used in clinical care or a community setting (140, 141). We have adapted these

principles to our educational intervention. The adaptation implies an intention-to-treat analysis, where the intervention was offered to all the included out-of-hours GP cooperatives without any follow-up of the implementation locally. This approach has at least two advantages. The first is that it increases the feasibility of the study. By leaving the responsibility of the educational intervention to the local leaders of each cooperative, it was possible to make the educational material and carry out an RCT as the third study in the frames of a Ph.D.-grant, without any other support than the two supervisors. Secondly, it makes the study more like a real-world situation, and the intervention could have been disseminated to all out-of-hours services in the country. In this way, our study reduces the gap between research and standard clinical practice and increases the study's generalizability.

The intention-to-treat analysis also implied that all the out-of-hours GP cooperatives were included in all analyses regardless of intervention implementation. Hence, a weakness is the lack of information on delayed or missing attendance among the cooperatives. We have reason to believe that several out-of-hours GP cooperatives implemented the intervention during or after, as opposed to the desired before, the three winter months. All the cooperatives in the intervention group are included as participants in the statistical calculations, whether they participated or not. This inclusion could hide a possible effect of the educational program on the outcome during the specified period of the data collection. We tried to compensate for this weakness by including a proxy variable for nurse participation in the e-learning course in the statistical model. An ideal variable would be the share of participating nurses in each out-of-hours GP cooperative on the e-learning course and the group activities. In the lack of information on the number of employed nurses, we chose the population parameter "per thousand inhabitants served" as the denominator in the proxy. This variable may be of limited value, as it only includes participation in the e-learning course and not in the group activity.

Randomisation intends to balance potential confounding factors between groups under study (130). As there is a risk of difference in explanatory factors, like health-seeking behaviour, between small and large out-of-hours GP cooperatives, the

randomisation was stratified on the population size served. The adjusted estimates of incidence rate ratios and their 95% confidence intervals obtained from the negative binomial regression model showed no differences in counts between the groups at baseline. This finding indicates that the randomisation process worked well and that possible confounding factors are well-balanced between the two groups of out-of-hours GP cooperatives.

The Norwegian Directory of Health delivers reliable data on contacts with the Norwegian out-of-hours service (67). The risk of missing data on consultations is low. Data on telephone activity is less reliable, as some of the out-of-hours GP cooperatives do not send electronic compensation claims when advice is given by nurses solely (personal communication by e-mail and telephone with leaders of various out-of-hours GP cooperatives). This variation of practice means that the risk of missing data is higher for telephone consultations than for physical consultations, and we do not know the extent of the problem. The stratification and randomisation likely balanced this bias (130).

Count data are usually modelled by Poisson regression (142). However, the distributional mean was not equal to the variance in our dataset. Therefore, the Poisson regression model was extended, and negative binomial regression was used. The Bayesian information criterion (BIC) was used to check the negative binomial regression model's appropriateness over the Poisson regression model (143). This states that the model with the smaller BIC estimate is preferred over the model with a larger BIC. The negative binomial regression model had a smaller BIC estimate, confirming that it was the model of choice for our purpose.

5.2 Discussion of results

5.2.1 Antibiotic prescribing out-of-hour

The starting point of this thesis concerns the decisive moment of the antibiotic chain of events, i.e., when the doctor prescribes. Reasons for, and extent of, prescribing antibiotics for self-limiting diseases have been studied over several decades (58, 144, 145). The association between outpatient antibiotic consumption and antibiotic resistance rates supports the pertinence of such research in primary care (49).

Internationally, there seems to be a high variance in how doctors prescribe out-of-hours compared to in-hour in primary care, considering rates and quality parameters. We found a prescription rate of 34.2 % for RTIs in the two out-of-hours GP cooperatives investigated in paper I. This rate is lower than the rate of 41 % found in Trondheim's out-of-hours service but almost identical to the rate of 33.5 % in Norwegian general practice (41, 43). A Danish study found an overall out-of-hours antibiotic prescription rate of 15.9 % (92). This rate corresponds well with the overall prescription rate of 14.7 % found in paper I. Diagnostic coding is not used in the out-of-hours service in Denmark. Hence, it is not easy to compare directly with Norwegian rates for RTIs. Studies from the Netherlands and Sweden found higher prescription rates out-of-hours than in-hour (47, 146). The authors of both studies suggest that the prescribing is appropriate due to a higher urgency in the population that seeks healthcare out-of-hours. On the other hand, a Belgian study found that doctors in Flemish out-of-hours care prescribe highly inappropriate (88). These results could indicate that the differences between low- and high-prescribing countries are reflected both in-hour and out-of-hours.

Both countries with low and high prescription rates acknowledge the need for restrained antibiotic prescribing. So far, there have been very few antibiotic stewardship programs for out-of-hours care, and most have focused on the clinician’s responsibility rather than the circumstances in which the clinician works (102).

5.2.2 Busy sessions

The results of paper I indicate that busy sessions are independently correlated with antibiotic prescribing. The correlation was statistically significant, with an odds ratio of 1.38 (1.06-1.80). This correlation is not very strong. However, the prescription rate increased successively in each quintile, substantiating busyness as an explanatory factor. We did not find an equivalent correlation for the frequency of sessions per doctor, suggesting that the working environment plays a greater role than individual doctors' attributes. Some studies from general practice support a correlation between busyness and prescription rates, while others do not (44, 58, 86). None of these studies has made distinctions between busy sessions and busy doctors. The focus group study indicates that doctors have a unique prescribing pattern that is stable and well-known among nurses in their out-of-hours GP cooperative. A possible interpretation is that several aspects, including personal patterns and structural factors, like busyness, influence the decision to prescribe antibiotics.

Busy periods seem to constitute a threat to quality in emergency departments as well. One study found that emergency department crowding was associated with higher triage acuity and hospital admittance rates (147). Another found that the effect on admittance rates was even higher for patients with low triage levels than for patients with higher triage levels (148). Hence, busyness constitutes a quality challenge on various parameters in different healthcare settings. The finding of higher antibiotic prescribing during busy sessions may indicate such challenges even for other parameters in out-of-hours care. Neither the data available nor the scope of paper I permitted such analyses.

Results from the focus group study shed light on the problem of busyness within out-of-hours GP cooperatives. Epidemics or low GP-capacity induce long telephone queues, which make sessions busier for telephone triage nurses, with less time spent on counselling and more callers assigned to doctors' consultations. This leads to busier sessions for the doctors and nurses inside the out-of-hours GP cooperative and, consequently, longer telephone queues and, as shown in paper I, higher antibiotic prescribing. Nurses' perceived busyness also increases because 80 %

of all incoming calls must be answered within two minutes (2). Hence, external factors and the regulatory aim of high accessibility to out-of-hours services may contribute to a vicious cycle of busyness, including unnecessary consultations and inappropriate antibiotic prescribing.

In the focus group study, we found that the fee-for-service scheme pressured the nurses to bring in patients for the economic benefit of the doctors. This pressure may be described as a version of physician-induced demand (74). In a Norwegian setting, the fee-for-service scheme of primary care has been discussed as government-introduced perverse incentives, and leading voices argue for a shift towards fixed salaries (149-151). The challenges of busy sessions are arguments for removing factors that increase demand for doctor's consultations, like fee-for-service payment.

We also found that capacity shortages in the local list-holding GP scheme lead to an increased demand for out-of-hours consultations. This finding is consistent with the current national crisis of the list-holding GP scheme that has led to increased use of out-of-hours services (152). These consequences have been hard to handle for the municipalities. It illustrates how policymakers can influence the use of healthcare services from a political or administrative level, either through direct actions or through the lack of actions. Another example is from Australia, where the use of private enterprises to solve the shortfall of out-of-hours services led to higher use of this service at a considerable cost for the government (73).

To summarise, epidemiological, administrative and political drivers of busyness are impossible to control for individual nurses yet affect the premises for their work and, consequently, for the doctors' work in powerful ways.

5.2.3 The challenges of telephone assessments and triage

Despite the focus group informants' reluctance to call themselves gatekeepers, the municipalities expect the nurses to play a gatekeeping role. Both strategic and financial considerations determine this expectation. The list-holding GP scheme works best when people stay confident with their GP (32). Moreover, hardly any Norwegian

out-of-hours GP cooperative is scaled to give medical consultation to every caller every day of the week. Manning out-of-hours GP cooperatives is more expensive for the municipalities than manning daytime GP practices. Hence, telephone triage nurses' role is to assess whether a caller's symptoms concern the healthcare system out-of-hours.

In the second half of 2013, the out-of-hours GP cooperative in Tromsø intervened through a mass media campaign (153). They aimed to change their population's habit of direct attendance towards calling the local emergency medical communication centre first. This campaign led to significantly fewer direct attendances, fewer medical consultations in the out-of-hours GP cooperative, and an increased share of telephone consultations by nurses. These results are in line with research on telephone triage in emergency departments. A review of reviews concludes that telephone triage systems have the potential to reduce inappropriate visits to emergency departments (105). Swiss researchers conclude that nurse telephone triage service reduces the use of emergency departments and that most callers follow the nurses' advice (154). Hence, telephone triage may influence the population's use of healthcare resources.

There is, in other words, a tension between research literature, expectations of municipalities, the public and how the telephone triage nurses perceive and perform their tasks. Michael Lipsky describes situations like this as dilemmas of the individual in public service, and his label "street-level bureaucrats" could fit telephone triage nurses in this setting (112). Lipsky claims that the jobs of street-level bureaucrats will not be performed according to the highest standards because of a lack of necessary time or resources to handle each citizen's needs appropriately. To balance the demands of the public and the demands of the state, the bureaucrats will use discretion. Johannessen has explored the relationship between standardisation and discretion in a triage setting for patients already present in an out-of-hours GP cooperative (155). He shows how the nurses use discretion in different ways when they judge the triage scale to be inferior to their clinical assessment.

In the focus group study, we found that nurses use discretion and deviate from triage scales for callers with symptoms of RTIs. One way they use discretion is by negotiating with callers. Concretely, they negotiate about the need for a doctor's consultation. More profoundly, one could argue that the negotiations concern whether the caller's illness description aligns with the nurses' perception of disease (156). The answer to this question could be more subtle than evident for RTIs, as very few of these callers fit into one of the categories of acute or subacute conditions (42).

5.2.4 RTIs – Temporary normality or disease?

Most people suffer from an RTI one or more times per year (52). A condition that returns so frequently to all human beings could be considered temporary normality instead of needing medical attention (156). This perspective is hardly useful to a telephone triage nurse on duty, and it may even be provocative for a caller suffering from symptoms of an RTI. However, from an antibiotic stewardship perspective, it is a pertinent one.

The invention of antibiotics made symptom relief of bacterial RTIs possible, leading to widespread and ever-increasing use. Antibiotic resistance was an inevitable consequence, already foreseen by Fleming, penicillin's discoverer (157). The dawning understanding of the need for antibiotic stewardship has led to numerous educational interventions and awareness campaigns for prescribers (86, 158). The focus has mainly been on separating bacterial infections from viral, avoiding antibiotics for the latter. This strategy implies that RTIs have an explanatory nature and that it is possible to differentiate (156). In Norway, rapid tests like C-reactive protein (CRP) and streptococcal antigen tests have been widely used for this purpose (159). In doing so, healthcare workers may have taught the population that these tests are of great value in dichotomizing normality from disease, bacterial from viral.

The informants in the focus group study reported that people call the out-of-hours service because they want to have their CRP measured. The prevailing view among at least parts of the public seems to be that technology may define human

ailment, separating illness from disease (156). However, even though most bacterial RTIs are self-limiting, the essential diagnostic task should be to decide whether someone suffers from an "in-need-of-treatment " condition or not (52). Thus, the informants' habit of performing discretion by negotiating with callers may be appropriate. Through negotiations, it may become more apparent to both parties what underlying expectations the caller has, and the conversation may reveal whether there are symptoms of a condition needing treatment. One of the strategies the informants mentioned was to refer to updated guidelines in the field of antibiotic stewardship. An understanding that the caller has a good general condition, despite other symptoms from the respiratory tract system, may lead to a discussion about guidelines and how they recommend abstaining from antibiotic treatment. In this way, the caller may stay home and observe instead of coming to a crowded out-of-hours GP cooperative. The patient will most probably benefit from staying home, avoiding the waiting room, the risk of getting infected by other patients and the risk of an antibiotic prescription. For the nurse, this alternative may be consistent with the perceived role of the service provider.

5.2.5 The shortcomings of triage scales

In most out-of-hours GP cooperatives, telephone triage nurses are supposed to follow triage scales and sort patients accordingly (10). In the focus group study, we found that clinical knowledge and skills often trump triage scales in telephone triage nurses' assessments of RTI callers. The study revealed several reasons for this. One reason was the informants' experience of callers with an unexpected clinical severe course. Another reason was that triage scales offer less support in the process of advising callers with low-urgency RTIs. Manchester telephone triage system will be used as an example to illustrate the latter for a caller with a cough (83). This symptom does not have a specific chart and needs to be assessed by chart 15, "Sick grown-up". Suppose the caller has a cough and a body temperature of more than 38.5℃ one hour after antipyretics. In that case, the chart will yield a yellow triage and recommend a doctor's consultation within two hours. Hence, this chart forces the nurse to give a

doctor's consultation to callers with self-limiting symptoms of RTIs when fever is present. If the nurse is to use clinical skills, assuming the presence of the flu or other self-limiting conditions, the triage scale must be overruled.

Statistical considerations may be of use in this discussion. Triage scales are, by nature, relatively rigid, aiming to categorise each caller's illness according to clusters of properties (156). The main aim of the scales is to identify callers with high-urgency conditions (160). Triage scales have high sensitivity for acute cases at the cost of low specificity (161). Furthermore, the pre-test probability of high acuity is low for the RTI population calling the Norwegian out-of-hours service (42). Hence, the positive predictive value is low, and the nurses will experience a large over-triage for RTIs (161). Translated to practical reality, many RTI callers brought into the out-of-hours GP cooperative with yellow or red triage will appear to have low-acuity and self-limiting conditions.

5.2.6 The challenge of changing practice

Results from the focus group study indicate that it may be challenging to influence the number of RTI consultations through an educational intervention. However, high-quality telephone consultations seem to increase the appropriateness of decisions in telephone triage (104). In addition, the communication quality of telephone triage varies according to the profession of the triagists, indicating that certain practices may be learned (162). We had a zero result on both primary and secondary outcomes in paper III. Hence, it is pertinent to discuss whether this was due to weaknesses in the educational activities.

The department of general practice at the University of Oslo has extensive experience using QIC in quality improvement programs for GPs within different areas (45, 163). For the educational intervention study, we built on this experience and included several QIC principles (101):

- Implementation of audit-and-feedback

- The subject for the intervention was perceived as pertinent and needed by the informants in the focus group study (representing the target group)
- The subject was recognised as important by the Norwegian government of the time (164)
- Involvement of participants through the e-learning course and group discussions
- Data for the group discussions were from a reliable and good source (67)

On the other hand, several QIC factors were only weakly or not included (100). Through the material for the group discussions, we encouraged the nurses to set goals for their practice. However, the goals were not clearly defined from our part, as imposing an externally set goal of reducing the number of RTI consultations could be problematic. We did not know the current practice of each of the 31 out-of-hours GP cooperatives and could not predict whether they needed to reduce the number of RTI consultations. Also, clearly defining a goal of keeping sick people from seeking healthcare could be considered unethical.

Even though we built on an audit-and-feedback principle, there was no reporting back after activities (100). Such reporting back would not have been feasible within the project scope, as we would have had to extend the project period by at least one year and measure the outcome for three winter seasons.

The principle of reciprocal learning and preparing for continuous learning are difficult to implement without being present in the group activities (100). Hence, it is not possible to predict whether these were applied. Overall, it is difficult to conclude that a lack of pedagogical principles is the reason for the zero results of the intervention.

Another perspective in this discussion is how telephone triage nurses are one of many actors in a complicated chain of events ending with antibiotic consumption after a consultation in the out-of-hours GP cooperative. The focus group informants described that callers' former experience with antibiotics prescribed for RTIs leads to high expectations for a doctor's consultation. The expectation for a doctor's

consultation is the last and closing link in the out-of-hour chain of antibiotic consumption, as shown in figure 3. Little et al. found that immediate prescribing for RTIs, compared to a delayed prescribing strategy, increases the belief in the effectiveness of antibiotics despite a lack of difference in symptom control between the two strategies (98). Swedish researchers describe how a common practice in primary healthcare centres is associated with prescribing according to guidelines (165). Common practices include interprofessional discussions, nurse triage, self-care advice, GPs' diagnostic process, and patient expectations. Hence, the intervention may have been too limited, as it solely targeted nurses and not the team they are a part of or the callers and their preconceptions.

5.2.7 The challenge of patient choice

A fundamental question for patients and stakeholders of primary care is: Who is in charge? Is time and place for medical assessment only a question of patient choice? Moreover, does the caller have the right to claim a need for medical attention, even out-of-hours? Furthermore, to what degree can a healthcare system operate on its own terms, setting limits for which conditions and emergency levels it shall handle?

In the focus group study, we found that nurses use a persuasive communication strategy to reach the desired consensus with the callers. The word persuasive has a connotation of power and superiority, indicating that the strategy brings along challenges.

Annemarie Mol's understanding of the logic of choice entails that the population could choose the out-of-hours service if they find it suitable, irrespective of their medical condition (114). The consequence would be that healthcare services do not need persuasive telephone triage nurses. Their task would be to outline the possibilities and the consequences of each possible choice and let the rest be up to the caller. According to the logic of choice, there are only neutral choices, and each caller can choose freely between different options.

Mol asks to what degree a suffering human can make a free choice (114). How do fever, cough and muscle pain affect a person's ability to make rational choices between (un)equal options? The focus group informants discussed how a large part of the population has limited knowledge about the natural course of, and self-care for, RTIs. This lack of knowledge will diminish callers' ability to choose the right level of care for their ailment. Hence, if the nurses follow the logic of choice, the lack of knowledge about common infectious diseases could constitute a health threat for the caller.

On the other hand, results from the focus group study show how some callers underreport symptoms of high-urgency conditions, even severe RTIs. A caller with poor communicative skills who underreports grave symptoms may struggle to surpass the gatekeeper, ending with poor clinical outcomes, powerlessness, and loss of autonomy. The focus group study also showed how other callers exaggerate their symptoms. These callers seem to insist on making their own choice, knowing how to push all the right buttons to get the consultation they want.

Mol's logic of care contrasts the logic of choice and may contribute to resolving the issues of power and autonomy described above (114). According to the logic of care, it is important to do good and to make life better. What this good is must be established along the way. It may be different between lives or in different moments in life. For suffering humans, healthcare personnel may explore different options in collaboration with the patients, enlightening the possible consequences of each choice. In doing so, they may exchange experiences, knowledge, suggestions, and words of comfort. The conversation will probably be different for a low-educated person living alone than for an academic professor living in an extended family, even if they seemingly present with the same symptoms.

The logic of care may be a good framework for the discretion performed by telephone triage nurses. Triage scales do not consider different lives or moments in life. Discretion may do. However, discretion needs to be performed with the perspective of doing good to keep in step with the logic of care. If a waiting room crowded with people having contagious diseases awaits the caller with a sore throat,

the doing good may be to use a persuasive communication technique to convince her that she is better off on her coach. If the exploration of resources and relationships indicates that the current caller does not understand which symptoms and signs should lead to a renewed contact with the out-of-hours GP cooperative, a persuasive technique to keep her home may be a misuse of power, possibly with severe clinical consequences. Hence, triage scales should never be the sole basis of telephone triage nurses' decisions. Clinical knowledge and a patient perspective that includes resources and relationships must be included in the assessments.

6 Conclusions

This thesis suggests that:

- The overall antibiotic prescription rate for RTIs in Norwegian out-of-hours GP cooperatives is at the same level as in the Norwegian list-holding GP scheme
- Busy sessions in out-of-hours GP cooperatives increase antibiotic prescription rates for RTIs
- Telephone triage nurses play an ambivalent gatekeeping role for out-of-hours GP cooperatives
- Structural and external factors largely determine how the population uses out-of-hours GP cooperatives for RTIs
- Triage scales are experienced inferior to telephone triage nurses' clinical skills in assessing callers with RTIs
- A pragmatic educational intervention for telephone triage nurses does not influence the use of out-of-hours GP cooperatives for RTIs

7 Implications for practice

The population's use of out-of-hours services for RTIS, and the following antibiotic prescribing, is a complex process involving decisions and interactions by policymakers, callers, nurses, and doctors. Norwegian primary healthcare faces challenges through its organizational diversity caused by municipality ownership. These challenges can only be overcome through a joint effort between all the parties involved. This thesis, therefore, suggests that

- Telephone triage nurses should use their clinical skills in addition to triage scales, taking into consideration relational and other capacities, when assessing callers with RTIs
- Leaders of out-of-hours GP cooperatives should work towards common local practices on how to handle RTIs within their entities, and this should include regular discussions between the local nurses and doctors
- Municipalities should consider fixed salaries for doctors working in out-of-hours GP cooperatives to avoid financial incentives as pull factors for more consultations out-of-hours
- Telephone triage nurses need enough time to handle callers with RTIs, also in busy periods caused by epidemics or other push factors
- The GP scheme should have the capacity to provide continuity of care even for RTIs
- Interventions to influence how the population uses out-of-hours GP cooperatives for RTIs should include the population, nurses, doctors and list-holding GPs

8 Implications for research

This thesis suggests that there is a need for more research to

- Explore the RTI-callers' perspectives, including parents, older people and people with limited Norwegian proficiency, especially on their experience of receiving advice instead of consultations
- Explore how Norwegian doctors perceive and practice antibiotic stewardship in out-of-hours services
- Assess nationwide prescription rates for out-of-hours services, including comparing prescription rates of GPs, hospital doctors and locums, in addition to comparing GPs' prescription rates when they work in their list-holding practices and out-of-hours GP cooperatives
- Explore and evaluate whether other measures may influence the number of RTI consultations and antibiotic prescription rates
    - A possibility for nurses in out-of-hours GP cooperatives to give RTI-callers an appointment with their list-holding GP the following working day
    - Broader interventions that address the public, nurses, GPs, and doctors working in out-of-hours services
    - Facilitation of professional conversations between nurses and doctors in out-of-hours GP cooperatives, aiming for common local practices in handling people with RTIs

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RESEARCH ARTICLE

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Antibiotic prescribing for acute respiratory tract infections in Norwegian primary care out-of-hours service

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ABSTRACT

Purpose: To examine factors correlating with antibiotic prescribing for acute respiratory tract infections (ARTIs) in Norwegian primary care out-of-hours service.

Materials and methods: Retrospective data analysis for the year 2014 in two out-of-hours primary care units located in the towns of Hamar and Tønsberg in Norway, analysing type and frequency of different antibiotics prescribed by 117 medical doctors for ARTIs, and factors correlating with these.

Results: The 117 doctors in two out-of-hours units diagnosed 6757 cases of ARTIs. 2310 (34.2%) of these resulted in an antibiotic prescription, where of 1615 (69.9%) were penicillin V (PcV). Tonsillitis and sinusitis were the two ARTI diagnoses with the highest antibiotic prescription rate. The antibiotic prescription rate increased successively with increasing activity level, measured as shorter median duration of consultations per session, from 28.7% (reference) in the least busy quintile of sessions to 36.6% (OR: 1.38 (95% CI =1.06–1.80)) in the busiest quintile of sessions. Prescribing of broad-spectrum antibiotics was not correlated with median duration of consultations per session. Female doctors had an OR of 0.61 (0.40–0.92) of a broad-spectrum antibiotic prescription compared to their male colleagues.

Conclusions: Antibiotic prescribing for ARTIs in the primary care out-of-hours services investigated is at the same level as in Norwegian general practice, but with a higher prescription rate of PcV. Antibiotic prescribing increases on busy sessions, measured as median duration of consultations per session. The work frame in primary care out-of-hours service might influence the quality of clinical decisions.

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Background

Antimicrobial resistance is a serious threat to global public health [1]. The prevalence of resistant microbes in human isolates is still low in Norway and other Scandinavian countries. However, even in Norway, the development has been less favourable [2].

About 85% of all antimicrobial drugs prescribed in Norway is prescribed in primary care, and around half of the antibiotic consumption in Norway is for acute respiratory tract infections (ARTIs) in general practice [3,4]. The self-limiting course of most of these conditions make them important targets for the desired reduction of antibiotic prescribing and the desired relative decrease of broad-spectrum antibiotics [5–7].

There were 2.63 consultations per citizen in daytime general practice and 0.26 consultations per citizen in the out-of-hours service in Norway in 2015 [8]. ARTIs constitute 9% of the consultations in general practice, while the corresponding proportion in the out-of-hours service is 16.7%. Hence, this service handles a substantial part of the ARTIs, and is thereby potentially an important contributor to the overall antibiotic consumption.

The 428 municipalities in Norway (median of 4661 inhabitants (2014)) own and run the out-of-hours primary care service. Two or more municipalities often collaborate to run one unit together. Participation in the out-of-hours work is mandatory for list-holding general practitioners (GPs) in Norway. In spite of this, only 55.5% of the duties were staffed by list-holding GPs in 2015 [9]. Many of these units pay their doctors by a fee for service plan, hence making it possible to give away sessions to other GPs or to doctors in

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hospital or scientific occupation with less or no experience in general practice. A high number of sessions generate higher income. In many units, a high number of consultations per session also generates more income. In most places, trained nurses decide which patients get a consultation with the doctor at the out-of-hours units, and which patients can wait to see their regular GP the next day.

In order to implement effective measures to improve the quality of the use of antibiotics in the out-of-hours setting, we need to know factors correlating with a high prescription rate. A systematic review on antibiotic prescribing for respiratory tract infections, found that acute bronchitis and features on physical exam were factors associated with antibiotic prescribing [10]. Physician's perception of patient desire for antibiotics was a stronger prediction for prescription than patient desire for an antibiotic. Among Norwegian GPs in daytime practice, there is a correlation between a high activity level, measured as a high yearly number of consultations, and both a high prescription rate of antibiotics and the rate of broad-spectrum agents for ARTIs [11].

Former results from research on prescribing pattern in out-of-hours service have been inconsistent [12,13]. In the Norwegian city of Trondheim, there was a higher prescription rate in the out-of-hours service than in daytime practice [11,14]. The aim of our study is to explore which factors that predict antibiotic prescribing and broad-spectrum prescribing for ARTIs in an out-of-hours primary care setting. Especially we wanted to explore whether the activity level, both at each session and for each doctor, was correlated with antibiotic prescribing.

Methods

We have made a retrospective data analysis for the year 2014 at two out-of-hours primary care units, located in the towns of Hamar and Tønsberg, covering respectively, four and six municipalities, with a total of 170,000 inhabitants. All the 128 doctors scheduled with at least one session in one of these units during 2014 were invited to participate. Fifty-nine doctors in Tønsberg (93%) and 63 in Hamar (97%) agreed to participate. Four doctors were not included due to lack of conducted sessions. We excluded one doctor as we were not able to extract the prescription data.

Data were retrieved from the two units' electronic patient record systems (Winmed 2), using software designed by one of the authors (SG) for this particular study. The following data were used in the analysis: GP identity (anonymised), gender and specialty status, number of sessions during 2014, date, duration and type of consultations, the total number of consultations on each session, prescribed antibiotics and patients' sex and age. For all consultations with R-diagnoses, except R06 and R84-R99 and all H-diagnoses indicating otitis media (H01, H70-72 and H74) from the 2nd International Classification of Primary Care (ICPC-2), the diagnose was retrieved.

Antibiotics were divided into groups based on similar antimicrobial effects or clinical indications. In some of the analyses, we dichotomised antibiotics into either penicillin V (PcV) or others. Some diagnoses were also grouped together based on their clinical similarities and in line with former publications; upper ARTIs and respiratory symptoms (R01–05, 07–29, 74 and 80), ear infections (H01, 71, 72 and 74), acute tonsillitis (R72 and 76) and 'other RTIs' (R71, 77, 82 and 83) [11,15]. Acute sinusitis (R75), acute bronchitis (R78) and pneumonia (R81) were analysed as single diagnoses.

As we did not have access to the work schedule, we defined one session as the time between the opening of the first journal and the closing of the last journal. When the time interval between two open journals exceeded eight hours, we defined it as a new session. Each consultation's duration was found in the electronic patient record software.

As a measure of each session's busyness, we built the variable *median duration of consultations per session*, based on the duration of and number of consultations. All sessions were divided in quintiles, based on their consultations' median duration, with the sessions with the longest duration of consultations as the reference quintile. As a measure of each doctor's session rate, we examined a variable called *median days between sessions*, divided in quintiles, with the longest time between sessions as the reference quintile. We performed two multilevel binary logistic regression analyses. The dependent variables were (a) antibiotics prescribed, yes or no and (b) broad-spectrum antibiotics versus PcV. The independent variables were the two out-of-hours primary care units, the patients' sex and age group, the groups of diagnoses, the doctor's age, gender and specialty status (family medicine), median duration of consultations per session and median days between sessions, with the individual GPs as clusters.

STATA 14 (College Station, TX) was used for the multilevel binary logistic regression and IBM ISPSS Statistics Data Editor Version 22 (Armonk, NY) for the descriptive statistics.

The study was presented to and approved by The Regional Committee for Research Ethics (2015/398/REK

Table 1. Antibiotic prescription practice of 117 doctors in 6757 ARTI consultations in two Norwegian out-of-hours units during the year 2014 by the antibacterial agents issued for the various ARTI diagnoses.

Diagnoses group	Total number of consultations	Total number of consultations with antibiotic prescriptions (%)	J01CE penicillin V (%)	J01CA + J01CF, penicillins with extended spectrum (%)	J01FA + J01FF, macrolides/ lincosamides (%)[a]	J01AA, tetracyclines (%)	Other J01 (%)[b]
URTIs and respiratory tract symptoms[c]	3543	670 (18.9)	501 (74.8)	27 (4.0)	101 (15.1)	30 (4.5)	11 (1.6)
Acute tonsillitis	538	432 (80.3)	368 (85.2)	10 (2.3)	52 (12.0)	1 (0.2)	1 (0.2)
Acute sinusitis	315	239 (75.9)	161 (67.4)	8 (3.3)	45 (18.8)	21 (8.8)	4 (1.7)
Acute bronchitis	340	136 (40.0)	57 (41.9)	14 (10.3)	24 (17.6)	36 (26.5)	5 (3.7)
Pneumonia	598	300 (50.2)	145 (48.3)	39 (13.0)	56 (18.7)	52 (17.3)	8 (2.7)
Ear infections	654	375 (57.3)	300 (80.0)	46 (12.3)	19 (5.1)	2 (0.5)	8 (2.1)
Other ARTIs	769	158 (20.5)	83 (52.5)	12 (7.6)	35 (22.2)	23 (14.6)	5 (3.2)
Total	6757	2310 (34.2)	1615 (69.9)	156 (6.8)	332 (14.4)	165 (7.1)	42 (1.8)

[a]Macrolides form 92.8% (erythromycin 78.6%, azithromycin 12.0%, clarithromycin 1.8% and lincosamides form 7.2%).
[b]Other J01: Co-trimoxazole (28.6%), quinolones (26.2%), first-generation cephalosporines (19.0%), trimethoprim (11.9%), mecillinam (11.9%) and third-generation cephalosporines (2.4%).
[c](% of all ARTIs) R01 (0.2%), R02 (5.1%), R03 (0.0%), R04 (0.3%), R05 (6.7%), R07 (0.1%), R08 (0.6%), R09 (0.6%), R21 (5.9%), R23 (0.1%), R24 (0.3%), R27 (0.1%) R 28 (0.0%), R29 (0.4%), R74 (30.2%), R80 (1.7%).

sør-øst) and by The Norwegian Social Science Data Services (42185/3/LMR).

Results

The material consists of data from 40,197 consultations (34,874 patients, 117 doctors), either in the out-of-hours office (39,796, 99%) or in the patient's home (401, 1%). The median number of sessions per doctor was 11 (range: 1–133), and the median number of consultations per session was 18 (range: 2–64). Consultations had a median duration of 12.1 min (11.5 min for ARTIs). Antibiotics were prescribed in 14.7% of all consultations.

ARTI was diagnosed in 6757 (16.8%) of all consultations (Table 1). Among patients consulting for an ARTI, there was a majority of female patients (56.1%), about the same as found for all diagnoses (54.3%). Children under six was the dominant age group (31.8%). 34.2% of patients with an ARTI received an antibiotic. 69.9% of these prescriptions were PcV. The macrolide erythromycin was the second most frequently prescribed drug, constituting 11.3% of the total prescribing for ARTIs. Upper respiratory tract symptoms (R01–R029) formed 20.5% and upper respiratory tract infections (R74 and R80) formed 31.9% of all ARTIs. 18.9% of patients with these diagnoses received antibiotics, where of 74.8% PcV.

Multilevel logistic regression analyses revealed that patients diagnosed with tonsillitis or sinusitis had the highest odds ratio of receiving an antibiotic (24.11 and 12.39) compared with the URTIs (Table 2). Children under six and the elderly had the lowest OR of receiving antibiotics. There was no statistically significant correlation between median days between sessions and prescribing rate. The quintile of duties with the shortest median duration of consultations per session had an OR of antibiotic prescribing of 1.38 (1.06–1.80) compared to the quintile with the longest median duration of consultations per session. The prescribing rate increased successively with shorter median duration of consultations per session, from 28.7% to 36.6%. There was no significant difference in prescribing between the two out-of-hours care units.

Bronchitis (OR: 2.96), pneumonia (OR: 2.65) and 'other ARTIs' (OR: 2.59) were the three diagnoses with the highest OR of a non-PcV prescription (Table 3). Children between six and 12 and teenagers had the lowest OR of receiving non-PcV. The prescribing of broad-spectrum antibiotics was neither correlated with median days between sessions nor with median duration of consultations per session. Patients in Tønsberg had an OR of 1.93 (1.35–2.76) (38.3% of total prescribing) of receiving broad-spectrum agents compared to patients in Hamar (24.8% of total prescribing). Female doctors prescribed less non-PcV than their male colleagues, with an OR of 0.61 (0.40–0.92).

Discussion

34.2% of patients diagnosed with an ARTI received an antibiotic prescription, and three out of four of these were PcV. Acute tonsillitis and sinusitis were the two diagnoses with the most frequent prescribing. Antibiotic prescription rate increased with shorter median duration of consultations per session.

Strengths and limitations

Our study is a retrospective data analysis. The results reflect the present reality as registered in the electronic patient records. The doctors involved were not

Table 2. Multilevel logistic regression analysis showing factors independently associated with 117 doctors' antibiotics prescribing for 6757 ARTI consultations in two Norwegian out-of-hours units in 2014.

	Number of ARTI episodes	Number of ARTI episodes with antibiotic prescriptions (%)	Odds ratio (95% CI)
ARTI			
URTIs and respiratory tract symptoms	3543	670 (18.9)	1 (reference)
Acute tonsillitis	538	432 (80.3)	24.11 (18.66–31.14)
Acute sinusitis	315	239 (75.9)	12.39 (9.22–16.66)
Acute bronchitis	340	136 (40.0)	2.74 (2.12–3.54)
Pneumonia	598	300 (50.2)	4.79 (3.85–5.95)
Ear infections	654	375 (57.3)	7.63 (6.26–9.29)
Other ARTIs	769	158 (20.5)	1.30 (1.04–1.61)
Patient's gender			
Male	2964	989 (33.4)	1 (reference)
Female	3793	1321 (34.8)	1.07 (0.95–1.21)
Patient's age			
<6	2148	515 (24.0)	1 (reference)
6–12	502	175 (34.9)	1.38 (1.08–1.77)
13–18	502	166 (33.1)	1.35 (1.05–1.75)
19–44	1850	818 (44.2)	2.25 (1.90–2.65)
45–64	919	357 (38.8)	2.11 (1.72–2.58)
65–79	499	178 (35.7)	1.60 (1.25–2.06)
>80	337	101 (30.0)	1.03 (0.76–1.40)
Doctor's gender			
Male	4825	1618 (33.5)	1 (reference)
Female	1932	692 (35.8)	0.91 (0.65–1.27)
Doctor's age			
26–29	946	276 (29.2)	1 (reference)
30–33	1408	441 (31.3)	1.17 (0.69–2.00)
34–39	848	275 (32.4)	1.20 (0.71–2.02)
40–44	1347	528 (39.2)	1.54 (0.90–2.62)
45–68	2208	790 (35.8)	1.02 (0.58–1.80)
Specialty family medicine			
No	4142	1480 (35.7)	1 (reference)
Yes	2615	830 (31.7)	1.04 (0.68–1.60)
Median days between duties, in quintiles (number of GPs)			
>32.5 (25)	311	93 (29.9)	1 (reference)
15.5–32.0 (20)	796	258 (32.4)	1.16 (0.68–1.97)
9.0–15.0 (26)	1021	387 (37.9)	1.19 (0.70–2.03)
4.5–8.5 (24)	1088	315 (29.0)	0.94 (0.54–1.64)
1.0–4.0 (23)	3541	1257 (35.5)	1.41 (0.83–2.41)
Median duration of consultations per session in quintiles (number of sessions)			
>14.77 (425)	958	275 (28.7)	1 (reference)
11.63–14.75 (429)	1280	434 (33.9)	1.15 (0.91–1.45)
9.42–11.63 (424)	1423	489 (34.4)	1.24 (0.97–1.57)
7.28–9.48 (425)	1658	585 (35.3)	1.16 (0.91–1.48)
0–7.27 (425)	1438	527 (36.6)	1.38 (1.06–1.80)
Out-of-hours unit			
Hamar	4216	1410 (33.4)	1 (reference)
Tønsberg	2541	900 (35.4)	1.17 (0.87–1.59)

aware of the plans of a research project at the time of the consultations, and there may be a lack of accuracy in the giving of diagnosis. An unknown but probably small number of children received an antibiotic mixture at the unit in Tønsberg. These are recorded in the same way as paper prescriptions and are therefore not detected by the data retrieval. We have no possibility to distinguish the patients who were at the out-of-hours units due to antibiotic treatment failure or follow-up due to former started treatment. We assume that the number of such patients is few, but it may influence our findings. The rate of doctors agreeing to participate was high. Hence, we believe that the results are valid and reflect the clinical reality.

The group of diagnoses called upper respiratory tract infections and respiratory symptoms include most respiratory tract symptoms, also diagnoses less likely to be associated with respiratory tract infections. The grouping is concordant with former research from Norwegian general practice, enabling a comparison with this research [11]. However, this way of grouping diagnoses may have led to an underestimation of the antibiotic prescription rate of upper respiratory tract infections. The variable *Median duration of consultations per session* includes consultations for all possible diagnoses and not just ARTIs. By using median rather than mean duration of consultations, the variable also reflects that night sessions may be busy until

Table 3. Multilevel logistic regression analysis showing factors independently associated with 117 doctors' non-PcV prescribing for 6757 ARTI consultations in two Norwegian out-of-hours units in 2014.

	Number of ARTI episodes with antibiotic prescription	Number of ARTI episodes with non- PcV prescription (%)	Odds ratio (95% CI)
ARTI			
URTIs and respiratory tract symptoms	670	169 (25.2)	1 (reference)
Acute tonsillitis	432	64 (14.8)	0.49 (0.34–0.70)
Acute sinusitis	239	78 (32.6)	1.30 (0.90–1.86)
Acute bronchitis	136	79 (58.1)	2.96 (1.93–4.53)
Pneumonia	300	155 (51.7)	2.65 (1.89–3.73)
Ear infections	375	75 (20.0)	0.73 (0.51–1.04)
Other ARTIs	158	75 (47.5)	2.59 (1.72–3.90)
Gender			
Male	989	284 (28.7)	1 (reference)
Female	1321	411 (31.1)	1.12 (0.91–1.38)
Age			
<6	515	120 (23.3)	1 (reference)
6–12	175	26 (14.9)	0.56 (0.34–0.92)
13–18	166	26 (15.7)	0.56 (0.33–0.93)
19–44	818	229 (28.0)	1.07 (0.78–1.45)
45–64	357	155 (43.4)	1.55 (1.09–2.21)
65–79	178	86 (48.3)	1.58 (1.03–2.43)
>80	101	53 (52.5)	1.72 (1.02–2.91)
Doctor's gender			
Male	1618	520 (32.1)	1 (reference)
Female	692	175 (25.3)	0.61 (0.40–0.92)
Doctor's age			
26–29	276	71 (25.7)	1 (reference)
30–33	441	94 (21.3)	1.07 (0.54–2.11)
34–39	275	79 (28.7)	1.19 (0.61–2.31)
40–44	528	202 (38.3)	2.11 (1.10–4.04)
45–68	790	249 (31.5)	1.08 (0.70–1.67)
Specialty family medicine			
No	1480	401 (27.1)	1 (reference)
Yes	830	294 (35.4)	1.09 (0.67–1.78)
Days between duties in quintiles (number of GPs)			
>32.5 (25)	93	30 (32.3)	1 (reference)
15.5–32.0 (20)	258	80 (31.0)	1.06 (0.52–2.16)
9.0–15.0 (26)	387	123 (31.8)	0.76 (0.38–1.52)
4.5–8.5 (24)	315	65 (20.6)	0.62 (0.29–1.29)
1.0–4.0 (23)	1257	397 (31.6)	1.05 (0.52–2.11)
Median duration of consultations per session in quintiles (number of duties)			
>14.77 (425)	275	84 (30.5)	1 (reference)
11.63–14.75 (429)	434	128 (29.5)	0.72 (0.48–1.07)
9.42–11.63 (424)	489	156 (31.9)	0.95 (0.64–1.42)
7.28–9.48 (425)	585	184 (31.5)	0.85 (0.57–1.28)
0–7.27 (425)	527	143 (27.1)	1.08 (0.70–1.67)
Out-of-hours unit			
Hamar	1410	350 (24.8)	1 (reference)
Tønsberg	900	345 (38.3)	1.93 (1.35–2.76)

midnight, when most of the consultations occur, and then more quiet until early morning. Hence, we find that the variable is a valid proxy for the doctors' perceived time pressure, or busyness, in the actual session.

Results discussion

Prescription rate

We found an overall antibiotic prescription rate of 14.7%. A similar study from Danish out-of-hours primary care found a much higher prescription rate of 26.1% [16]. Still, the antibiotic consumption in the two countries are quite similar [17]. Hence, the overall antibiotic prescription rate in the out-of-hours service may reflect how the service is organized and used by the population, rather than the overall antibiotic consumption.

Patients in Norway will normally see their GP during daytime, both for acute and non-acute conditions. The out-of-hours services are supposed to handle conditions that cannot wait until the GPs open the next day or after the weekend. Although some people find it convenient to seek the out-of-hours units to avoid abstaining from work, there is reason to believe that the out-of-hours patient population is more acutely ill than the population in regular GP practice [18].

The patients are also unknown to the GP, and the possibility to follow-up is limited. The antibiotic prescription rate of 34.2% for ARTIs in our material is quite similar to the 33.5% found in daytime general practice [11]. This finding is therefore somewhat surprising, but in line with a former Norwegian study on tonsillitis and otitis in the out-of-hours care, and also in line with results from Flemish primary care [12,19]. A Dutch study on febrile children, however, suggests that GPs prescribe more antimicrobial drugs in the out-of-hours service than in regular GP practice [13].

An important finding in our study is the high proportion of PcV prescribing of 69.9%, close to the national goal of a 80% proportion of PcV for ARTIs [20]. This is about the same level found in the out-of-hours unit in Trondheim, but it is high compared to the finding of 41.2% in regular GP practice [11,14]. In both Trondheim and the two units in Hamar and Tønsberg, a report about diagnosis and treatment is sent to the family physician after the consultation at the out-of-hours units. An explanation may be that doctors working in transparent out-of-hours units are more adherent to guidelines than doctors working in regular general practice. This explanation is consistent with the findings from the RxPAD study, where audit and feedback among Norwegian GPs in peer continuing medical education groups, i.e. increasing the transparency of each GP's prescribing, led to a significant decrease in broad-spectrum antibiotic prescribing [11,15]. The lack of transparency in general practice may be seen as a challenge when it comes to antibiotic stewardship [21].

Factors associated with antibiotic prescribing

In a recent review, factors associated with antibiotic prescribing for respiratory tract infections were examined. More than 80 factors were found, and the article highlights doctors' perception of patient desire for antibiotics, the diagnosis acute bronchitis, as well as certain clinical findings such as fever, purulent sputum, abnormal respiratory exam and tonsillar exudate as the most important [10]. Our material does neither describe clinical findings nor doctors' perceptions. Also in our study, acute bronchitis is a predictor of antibiotic prescribing. However, as possibly bacterial infections are included, it is not surprising that these infections (sinusitis, tonsillitis) are stronger predictors of antibiotic prescribing than acute bronchitis. Working in the out-of-hours service is recognised as professionally demanding, and many GPs want to avoid working in the out-of-hours service, thereby giving away their duties to other doctors [18]. A majority of out-of-hours practices have a fee for service plan [9]. This may trigger an economic incentive both for some doctors to take many duties and, if possible, to increase the consultation rate. A Canadian study found that high-volume practice was associated with inappropriate antibiotic prescribing and GPs' consultations rate has been identified as a predictor of antibiotic prescribing for ARTIs in a Norwegian study [11,22]. The variable *median duration of consultations per session* in our study is a measure of how busy each session is for the doctor. This is a factor with little doctor's influence, as the triage is done by nurses. The doctors' job is to keep up with the pace decided by the triage. At busy sessions, ARTIs may be 'easy' consultations and an opportunity to reduce any delay. Even though duration of consultations is not, or only weakly, associated with antibiotic prescribing, doctors may consider to prescribe antibiotics partly to shorten consultations [23,24]. Hence, it is not unexpected that we found an increase in the prescription rate of antibiotics in sessions with shorter *median duration of consultations*.

The variable *median days between duties* is a variable highly influenced by the individual doctor, as each doctor can choose to take extra sessions to earn more money. We found no correlation between this variable and prescription rate.

Factors associated with broad-spectrum antibiotics

A Swedish study showed that older GPs chose broad-spectrum antibiotics to a higher degree than younger GPs and interns [25]. Female doctors had a higher overall prescription rate than their male colleagues, but there was no difference concerning the rate of broad-spectrum antibiotics. We could not confirm these findings. In contrary, our study showed that female doctors prescribe less broad-spectrum antibiotics than male doctors. Other factors that have been shown to be associated with broad-spectrum antibiotics are lower respiratory tract infections, patients' age (higher for older patients), long patient list, doctors being high prescribers and doctors with a high practice volume [11,22,26]. We also found a high broad-spectrum prescription rate in the elderly and for acute bronchitis and pneumonia. We found no association neither between *median duration of consultations per session* nor *median days between duties* and broad-spectrum antibiotics. Like an American study, we also found a geographical difference between the two units [27]. The distance between our two units is too small to expect any difference in microbial flora. It is

more likely that the observed difference is explained by local factors, such as a variation in the treatment culture of the involved doctors.

Conclusion/implications

We found an antibiotic prescribing for ARTIs similar to earlier results from studies on Norwegian general practice, but with a higher prescription rate of PcV. This may be due to the higher degree of transparency in the out-of-hours units, and whether the routine to send a report to the patient's GP should be implemented in all out-of-hours units needs to be investigated further. Antibiotic prescribing increased on busy sessions, measured as shorter median duration of consultations per session. As the work load in the out-of-hours units is highly determined by the number of patients getting an appointment, the question of how the triage influences work frame and thereby clinical decisions, needs further attention.

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Disclosure statement

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Phone triage nurses' assessment of respiratory tract infections – the tightrope walk between gatekeeping and service providing. A qualitative study

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ABSTRACT

Background: Phone nurses triage callers to Norwegian out-of-hours cooperatives to estimate the appropriate urgency and level of care for the caller. Many callers with mild symptoms of respiratory tract infections receive a doctor's consultation, which may lead to busy sessions and in turn impair clinical decisions.

Objective: This study explores how phone triage nurses assess callers with mild-to-moderate symptoms of respiratory tract infections and their views and experiences on triaging and counselling these callers.

Methods: We conducted four focus groups with 22 nurses (five men and 17 women aged 24–66 years) in three different locations in Norway. The interviews were transcribed verbatim and analysed by systematic text condensation.

Results: The informants were reluctant to call themselves gatekeepers. However, their description of their work indicates that they practice such a role. When nurses and callers disagreed about the right level of care, the informants sought consensus through strategies and negotiations. The informants described external factors such as organisational or financial issues as decisive for the population's use of out-of-hours services. They also described callers' characteristics, such as language deficiency and poor ability to describe symptoms, as determining their own clinical assessments.

Conclusions: Nurses perceive assessments of callers with respiratory tract infections as challenging. They need skills and time to reach a consensus with the callers and guide them to the right level of health care. This should be considered when planning nurse training and staffing of out-of-hours cooperatives.

KEY-POINTS

- Phone triage nurses assess callers to the out-of-hours service and estimate the level of urgency
- This study explores how phone triage nurses assess callers with respiratory tract infections and their views and experiences on this task
- The nurses describe their professional role as a tightrope walk between gatekeeping and service providing
- The nurses seek consensus with callers through strategies and negotiations

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Out-of-hours; primary health care; phone triage; respiratory tract infections; nurses' role; qualitative research

Introduction

In many middle- and high-income countries, out-of-hours primary care is provided by large-scale General Practitioners (GP) cooperatives staffed by nurses and doctors [1,2].

In Norway, GPs work shifts in the municipality-owned out-of-hours cooperatives and serve as gatekeepers to secondary health care. The population is encouraged to call, rather than showing up when they perceive that they need medical attention out of hours. Nurses assess these phone calls and decide whom they can handle by phone counselling alone, who can wait home and contact the regular GP the next day, and who needs an appointment with a

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doctor in the out-of-hours GP cooperative. Hence, the number of calls, and in turn how many callers the nurses assign for a doctor's appointment, determine how busy each session will be for the on-duty doctors.

There is concern about overuse of out-of-hours health-care services [3]. Too many people seeking help from a service with limited resources will lead to busy sessions and inevitably allow less time to take care of patients in the highest need of care. Busy sessions may also impair the quality of care, as demonstrated in the case of inappropriate antibiotic prescribing [4]. In addition, a low threshold for professional evaluation of mild infections might reduce the population's belief in self-evaluation over time [5].

In Norwegian out-of-hours service, there were 252 consultations per 1000 inhabitants in 2019 [6]. In 2014, nurses managed 23% of all incoming calls by phone counselling alone [7]. Respiratory tract infections are mostly self-limiting and a majority of people with these infections do not need to see a doctor for strict medical reasons. However, respiratory tract infections constitute almost 16% of all consultations in out-of-hours health care in Norway [6]. Most studies on the performance of nurse triage focus on acute, life-threatening conditions and show that it works well for high urgency cases [8]. To our knowledge, no studies have focused on the assessment of callers with mild-to-moderate conditions, such as respiratory tract infections, on how nurses judge their own role in these assessments, nor on nurses' own conception of the gatekeeping role for these callers. Understanding why so many people with mainly self-limiting conditions prefer to seek medical care after hours and why the gate is held open for them may contribute to more rational use of out-of-hours primary health-care services.

This study aimed to explore how nurses assess callers with mild-to-moderate symptoms of respiratory tract infections and their views and experiences on triaging and counselling these callers.

BHL is a GP. He has worked shifts in an out-of-hours cooperative for almost 20 years and been the head physician in the same cooperative for the last 6 years. IKR is a long time GP and a researcher. She is a former head physician in an out-of-hours cooperative. SH is a GP and a long-time researcher in the field of antibiotic prescribing and respiratory tract infections. We share a common interest in factors influencing clinical assessments in general, and antibiotic prescribing in primary care in particular.

Design, materials and methods

This qualitative study is based on four focus group interviews. Two groups were interviewed in their own out-of-hours GP cooperatives in two different counties in June and September 2018. The groups comprised only the nurses working at the particular cooperative. The other two group interviews were held during the annual conference for the primary care out-of-hours service in Norway [Den nasjonale legevaktkonferansen 2018] in September 2018. The two first groups were recruited through direct contact with their leaders by e-mail and telephone. For the last two groups, we did a purposive sample recruitment from the conference's participatory list. We contacted potential candidates by e-mail, aiming for variety in gender, age, size of out-of-hours cooperative and geographical location. We continued the recruitment process until we reached the desired number of six participants in each group.

The 22 participants' (five men, 17 women) median age was 42 years (24–66 years). Their median out-of-hours service experience was 7.5 years (1–22 years). The participants represented out-of-hours GP cooperatives from all Norwegian regions. One of the groups consisted of women only. Table 1 presents the characteristics of the participants and the out-of-hours GP cooperatives.

We developed an interview guide that covered four main themes: (1) General considerations about respiratory tract infections in the out-of-hours service. (2) Reasons why persons with mild symptoms of respiratory tract infections receive appointments to see a doctor after hours. (3) Experience with nurse counselling solely of callers with respiratory tract infections.

Table 1. Characteristics of the participants and the out-of-hours GP cooperatives.

Total number of participants	22
Median age	42 (24–66)
Male	5
Women	17
Median years of experience in out-of-hours service	7.5 (1–22)
Number of GP cooperatives represented	13
Small (< 50,000 inhabitants)	9
Large (> 50,000 inhabitants)	4
Median number of inhabitants of out-of-hours GP cooperatives	41,743 (22,205–76,649)

(4) Factors promoting or hindering a strategy to make the callers wait to see their regular GP the next day. The interviews lasted around 90 min and were recorded digitally. Two of the authors (BHL and SH) acted as moderators. The interview guide was followed pragmatically and adjusted after each focus group. Ideas and experiences that emerged and were discussed in early focus group interviews, e.g. the term gatekeeper, were introduced in later focus group interviews.

Analysis

BHL transcribed all the interviews. BHL and SH analysed the transcripts following systematic text condensation using a four-step method [9]: (1) We read the whole text to obtain total impressions and identify preliminary themes. (2) We Identified meaning units and established code groups concerning the process of assigning doctor's appointment to callers with symptoms of respiratory tract infections and sorted the meaning units correspondingly. (3) We systematically abstracted condensates and summarized the contents from each code group. (4) Finally, we generalized the descriptions and concepts for each theme.

IKR read the synthesised descriptions and then the transcripts, thus controlling the interpretations and results backwards.

BHL translated the informants' quotes into English and gave them fictitious names.

NVivo software was used to manage the data [10].

The informants gave their informed consent to participate in the study and the Norwegian Centre for Research Data approved data protection (58953/3/EPA).

Results

Four result categories emerged from the transcript. The informants described their professional practise as a tightrope walk between gatekeeping and service providing. They sought consensus with the callers, using strategies and negotiations, and they described both structural factors and callers' characteristics influencing their assessments and the use of the out-of-hours service.

Nurses' professional practise – a tightrope walk between gatekeeping and service providing

The nurses answered phone calls from the public and managed the doctors' schedule in all out-of-hours GP cooperatives that our informants represented. They described a reality where the doctor's accessibility had to be restricted for capacity reasons; hence, they described a de facto gatekeeping role. However, several of our informants spontaneously expressed that they did not regard themselves as gatekeepers for the out-of-hours service.

In spite of these statements, the general attitude among the informants was that the out-of-hours service existed for what they judged as urgent medical matters. They expressed that whatever could wait, should wait. The informants wanted to assign doctor's appointments primarily based on their medical judgement.

> Oliver: It irritates me when people call and say that they want to reserve an appointment. That makes me quite rigid. These people really have to be sick to get an appointment. "Reserving an appointment" is not how things work here. The out-of-hours service is for those who really need it.

At the same time, the informants indicated that 'service provider' was the best description of their conception of their own role. To provide service was not necessarily to give in to the caller's demands, but to provide what they considered was the best level of care for the caller. If the nurses judged that the best level of care was a next-day appointment with the callers' GP, the provided service was to deny the request for an appointment in the out-of-hours GP cooperative. In this way, they were able to overcome an apparent antagonism between gatekeeping and service-providing roles.

The informants explained that it could be difficult to distinguish between the callers' demands and needs. All described recurrent experience with callers who wanted to see a doctor in the out-of-hours GP cooperative, where the nurses judged it unnecessary from a medical point of view. In these situations, the most common strategy was to seek consensus by convincing the caller that it was not necessary to see a doctor out-of-hours for these particular symptoms. When consensus was impossible to reach, the solution was usually to grant the caller the desired appointment.

> Mathilda: In a way, it depends on how angry they get. I very seldom quarrel. If we must argue our way through the call, I would rather give them a doctor's appointment.

Some of the informants described a constant uncertainty concerning their own assessment of callers. This feeling of uncertainty could remain for hours after their shift ended. They feared having missed symptoms indicating grave disease or they feared an

unexpected and serious infection. Their previous experiences with the unpredictable and abrupt progress of disease contributed to this fear. Hence, the informants considered it a huge responsibility not to give callers a doctor's appointment. Several talked about the necessity for detailed documentation of their assessment and the advice given. The informants assumed that this would support the nurse's decision in the case of an unexpected and serious progress of respiratory tract infections and an eventual injury complaint.

> Megan: You never sit in that chair and feel confident.

The nurses considered triage scales as useful tools to assess callers with high-emergency conditions. For callers with respiratory tract infections, however, they considered triage scales inferior to their own clinical assessments, because this group normally would be considered low urgency on triage scales. Hence, as the triage scales gave no decision support for these callers, a clinical judgment of high urgency would always overrule the possible low urgency as indicated by a triage scale.

The informants discussed how they assessed particular doctors and their antibiotic prescribing patterns. Opinions differed as to whether keeping patients away from high prescribers, was a task for nurses. For some, being on duty with a low prescriber worked as an argument to keep callers away from the out-of-hours cooperative. They would tell the caller that there was no need to come to a consultation because the doctor would not prescribe antibiotics.

Strategies and negotiations towards consensus

The informants described situations where a caller wanted to see a doctor in the out-of-hours GP cooperative and the nurse judged it unnecessary due to low level of urgency (green code) as situations similar to negotiations. In these negotiations, different strategies were used to achieve consensus that it would be safe for the caller to not have a doctor's appointment out-of-hours. One of the strategies they described in the reassuring process was the triage itself. Several informants talked about how a low level of urgency and its corresponding green colour code, as opposed to medium (yellow code) and high (red code) level of urgency, became an argument to stay home or seek the GP later. This could also be an argument of convenience: i.e. a green code would mean a long wait time at the out-of-hours GP cooperative; therefore, it would be better for the caller to observe the situation at home.

> Ruby: Being green is good for you, actually.

Another strategy described by the informants was to appear confident and convincing. The informants discussed how this communication technique could make it easier to come to an agreement with the caller about other measures than seeing a doctor in the out-of-hours GP cooperative. Referring to clinical knowledge or official guidelines on antibiotics or respiratory tract infections lowered expectations to what the caller could achieve by coming to the GP cooperative and strengthened the argument that self-management would be the best.

> Sophia: It is okay. You say that they cannot come. Moreover, you have to give good advice and appear convincing. You cannot communicate; "I am a little insecure, but try to follow my advice anyway". However, if you are very persuasive in how you give advice, supervise and communicate with the caller; my feeling is that it makes them feel more confident.

In all the groups, the informants mentioned safety netting as a third strategy in the negotiating process. The safety netting was described as presenting detailed information on signs of clinical worsening and how to act if it should occur, which created a sense of security for both nurse and caller. The informants felt that giving assurance of the possibility to call back at any time was often decisive for the callers' acceptance of observing their condition at home. Several of the informants also pointed out the necessity of thorough documentation because this would prevent giving advice repeatedly and thereby ease the communication with future contacts.

> Mia: The threshold is very low for calling back or coming if they are worried or if the clinical situation worsens. The door is open. They can come back, and I think most callers appreciate that. They feel a lot more reassured when they know they can come or call back. We have open doors day and night.

A fourth strategy was the use of laboratory tests without a clinical examination. Some informants considered it a last strategy if they were unable to reach consensus otherwise. The nurses invited the caller to come to the out-of-hours GP cooperative to test for streptococci or measure C-reactive protein (CRP). If the laboratory tests were negative, both the nurse and the caller would judge it as a decisive argument that a doctor's appointment was unnecessary.

> Olivia: But it does actually happen that you have someone on the phone whom you think can wait for the regular GP, but he strongly insists, and you offer or agree that he can come to measure his CRP. If there is nothing on the CRP, he will not get to see the doctor.

Structural factors influencing the use of the out-of-hours service

In all the focus groups, the participants discussed structural factors influencing the use of the out-of-hours service.

A widespread opinion was that the fee-for-service payment of doctors made some doctors want more consultations in the out-of-hours GP cooperative. Several informants discussed how doctors might ask for more callers to be assigned for consultations to increase their income. The degree to which the doctors' wishes influenced this aspect of the nurses' professional practice varied among the informants. Some admitted that it was difficult not to lower the threshold for assigning callers for consultation, while others claimed that they were not influenced.

> Olivier: They (the callers) are sick, after all, but they could very well have waited. However, it happens very often, at least with us, that the doctor wants to see patients because then they will receive more money.

In one of the out-of-hours GP cooperatives, the service plan had changed to grant the doctors a fixed salary on most duties, which had lowered the number of consultations. The impression was also that the doctors took more time for thorough clinical examinations, which in turn led to less inappropriate antibiotic prescribing.

According to Norwegian regulations, the out-of-hours GP cooperatives are obliged to respond to incoming calls within two minutes [11]. The informants discussed how this regulation increased the callers' expectations of the out-of-hours cooperatives' availability compared to their GPs' offices. They also discussed how seeing a doctor after hours suited many people better than seeing a GP in daytime within normal opening hours. Several informants mentioned that strikingly many people got sicker around the time when they get home from work.

> Eva: I feel that there must be convenience reasons when people call five minutes past four to say that they have had a sore throat and a fever since 10 am. I ask them, "have you called your GP?" And they say "No, it got a lot worse right now".

The informants described epidemics, the population's conception of low GP capacity and the fee-for-service plan in the out-of-hours service as non-controllable drivers of busy sessions. This busyness could lead to long phone queues. The informants discussed how they spent less time on counselling when there were long phone queues because they perceived it to be more time efficient to provide the callers with doctor's appointments. The result was an increase in busyness inside the out-of-hours cooperative, which in turn lead to a lower capacity to answer phone calls from the public. It could be difficult to break this vicious cycle.

> Eva: You do not have the time available that you should have spent on the phone, to maybe make them just stay home. There is this pressure the whole time. It is easier for us to just bring them in - and then chaos comes along.

Callers' characteristics influencing the use of the out-of-hours service

The informants described the characteristics of individuals or groups that considerably influenced the use of the out-of-hours service. A common theme in the groups was that the population had too little knowledge about the natural course of and self-care for respiratory tract infections. This inability of callers to distinguish between simple and serious respiratory tract infections created many worries and high expectancies of consultations in the out-of-hours service. The belief in a swift and painkilling effect of antibiotics, in addition to little knowledge of their side effects, were other reasons for the callers' expectation of doctor's appointments. The informants discussed how the same people paradoxically very often were concerned about the potential side effects of prescription-free painkillers. The callers' previous experience with antibiotics against the same kind of symptoms was perceived as one of their strongest motivations to see a doctor. In such cases, it could be very difficult to persuade the caller to wait at home and observe their condition.

> Lily: Often the caller says "the last time I needed antibiotics". Then they think they had to have it to get well. They do not understand that they might have recovered anyhow. It does not help if I say so.

In all the groups, the informants talked about callers with limited Norwegian proficiency as a particularly challenging group. The language barrier made it very difficult to make proper assessments of their conditions over the telephone. Therefore, people from this group of callers usually received a doctor's appointment.

Parents with sick children were described as another challenging group to communicate with. The informants discussed how some parents of young children wanted to place the responsibility of what might happen to their child with someone else. The conflict could often culminate if the nurse suggested that the

parents could observe their child's condition at home. Several of the informants described unpleasant experiences, where the caller had asked for a warranty that their child would not die the following night, in spite of modest symptoms. The situation could often turn into a discussion about responsibility. For the informants, it was difficult to keep their empathetic attitude towards the parents and their strong concern, and at the same time not let the parents shift the responsibility on to them.

> Erin: I feel that some parents with children use it as an extra security: "Now I have at least told someone else, so now it is not my responsibility if something should happen. I have passed it on to health personnel, so now it is their responsibility if … "

A common theme in all the groups was how many callers could both exaggerate and underestimate the degree of urgency. The informants described this as challenging, especially because they felt that exaggeration was used strategically to get a doctor's consultation.

> Megan: I can hear that too. People have rather learnt what we ask. Because they say - almost before we say anything - all the things they know we will ask.
>
> Erin: They build a clinical picture to force us to take them in.
>
> Megan: Yes. They do.

Underestimation and understatements boosted the conception of phone assessments as demanding. Callers who reported minor symptoms but appeared at the out-of-hours GP cooperative gravely ill gave the informants an impression that there was an unpleasent level of chance in phone assessments. A seasoned nurse summed up her experience with people who underrated their own symptoms in this way:

> Megan: Sometimes I think it is kind of by coincidence that we do the right things.

Discussion

Summary of main findings

The informants described a de facto gatekeeping role in the out-of-ours service. However, they considered themselves as service providers rather than gatekeepers. Negotiations and various strategies were used to maintain the balance between these two roles. The informants described callers' characteristics and external factors interfering with the possibility to reach consensus.

Gatekeeping and service providing – equilibrium on the tightrope

Health-care professionals and the public may have different views on which complaints warrant medical attention and care; thus, phone triage nurses experience the conflicting roles of being both carer and gatekeeper to limited health-care services as challenging [12]. Our informants recognised themselves primarily as service providers. The health-care system, however, also expects them to be gatekeepers due to the constantly higher demand for health care than the real supply. Sorting callers' needs from demands, and to some extent protecting patients from antibiotic high prescribers, were situations where the informants seemed to accept the role as gatekeeper – however with ambivalence. Personal uncertainty was part of the aftermath when the nurses had performed gatekeeping, even when consensus had been reached. Serving the two diverging tasks as both carer and gatekeeper seemed to be a tightrope walk where nurses strived to find a balance.

Michael Lipsky's theoretical 'street level bureaucracy' framework describes the dilemmas of the individual in public service [13]. Lipsky claims that the jobs of street level bureaucrats will not be performed according to the highest standards because of lack of time, information or other resources necessary to respond properly to the individual case. They will therefore use discretion in their work to balance the demands of the state and the demands of its citizens. The relationship between standardisation and discretion in triage nurses' priority setting has been explored in depth elsewhere, concluding that discretion is an inevitable and necessary part of their assessments [14]. Our findings indicate that nurses use discretion more when they assess respiratory tract infections than when they assess cases of higher urgency, as the triage scales are of less use in the low urgency cases.

Phone triage nurses need to build a mental picture of callers and their needs to make good clinical assessments [12]. By nature, a phone call is a much more difficult setting with completely different communicational premises than that of a regular consultation. The regulation that demands 80% of incoming calls must be answered within 2 min, and the informants' need to use discretion in the absence of relevant algorithms, are both factors making the phone assessment even more difficult.

Training has been shown to improve the quality of phone triage and increase the likelihood of managing phone calls definitively [15,16]. Our informants

described that knowledge of relevant guidelines counterbalanced their reported difficulties of assessments and made it easier to reach consensus. Hence, specific training may strengthen phone triage nurses' gatekeeping capacity.

Callers to the out-of-hours service with access to an emergency button to bypass the phone queue, use it with high accuracy, which indicates that they know when they are seriously sick [17]. Willingness to quarrel may be due to an underlying but non-expressed high degree of worry, which in turn can be a sign of a serious condition [18]. The phone nurses' ability to listen to the callers' worries, not their argument, is of vital importance. Hence, the informants' consensus-seeking strategy for mastering the dilemma of gatekeeping and service providing is a constructive way of performing discretion, rather than an unwanted practice. One may argue that the tightrope equilibrium increases patient safety in the out-of-hours care.

The rapid CRP test is widely used in Norwegian primary health care. The CRP test is performed in 55% of consultations concerning respiratory illness in out-of-hours care [19], possibly giving rise to an understanding among the patients that the test is necessary to assess the severity of an infection. However, the guidelines on antibiotic prescribing in primary care recommend the test only as a supplement to clinical examination. The informants' description of their use of a CRP test as part of a process of negotiations is comprehensible, but may be problematic. The results of a CRP test disconnected from a medical consultation has limited value and can be a false safety net for both the nurse and the caller [20].

Organisational aspects of out-of-hours care

The demand for a two-minute response time is a measure designed to increase the availability of health care by ensuring swift contact for urgent cases. However, the regulation increased the informants' perceived busyness. When external factors like epidemics entailed an increased number of incoming calls, they would often choose the less time-demanding solution of giving a doctor's appointment instead of the more time-demanding choice of giving advice only [21]. They described this as a vicious cycle that increased the length of the queues both on the phone and in the clinic, which impaired patient safety and quality. However, callers want reassurance and support, and involvement in clinical decisions can increase their adherence to recommendations [22]. Hence, nurses in the out-of-hours service need sufficient time to make good clinical decisions to meet the needs of both the public and health-care services.

Organisational aspects of Norwegian primary health care in both staffing and financing areas have been discussed in recent years [23,24]. The organisation of local GP offices has been shown to influence how patients use out-of-hours GP cooperatives [25,26]. Our informants identified both the fee-for-service payment and the different organisation of local GP offices as factors that influenced how they perform triage and how they use discretion. These challenges show how neither the public nor the health-care personnel seem to perceive primary health care as one coherent service. This should be addressed in future discussions about GPs and leadership roles in primary care, leading to a closer collaboration between out-of-hours services and regular GPs.

Caller's characteristics

Callers' characteristics influence triage nurses' assessments [27]. Our informants described it as decisive for the outcome of their assessments, especially the problem of exaggeration and underrating of symptoms. Strengthening the communicative skills of phone triage nurses may increase the possibility to identify both ends of the symptom description scale. Such identification will increase the likelihood of recommending the right level of care, even for patients with poor symptom presentation. In light of the arguments for the consensus-seeking strategy, the habit of providing doctor's appointment to low Norwegian proficiency callers is favourable and should be encouraged [28,29].

Methodological considerations

The informants described how they assess callers with mild-to-moderate symptoms of respiratory tract infections, and their views and experiences on triaging and counselling these callers. There is always a risk that recalling and telling weakens the internal validity. Direct observations in an out-of-hours service could have provided a more realistic story of what actually happens when nurses perform triage. Our aim, however, was to explore the informants' views and attitudes. We therefore judged focus groups as a feasible and pertinent method.

We chose a narrow study aim and a dense sample specificity. These factors, in addition to a strong and clear communication with the participants, indicate high information power in our material [30]. With 22

participants from different-sized out-of-hours cooperatives from various regions of Norway, we also think that our strategy of cross-case analysis is appropriate and strengthens information power. It would have been easier to perform all the interviews in local out-of-hours GP cooperatives only. We believe that our choice of including nurses from various parts of Norway has minimised the risk of internal culture in the groups and thereby strengthened external validity. Even with two local and two mixed groups, our impression is that there were no large differences between the groups. We did not include nurses from out-of-hours services in the two largest Norwegian cities because the populations of these cities tend to show up at out-of-hours clinics instead of calling in advance.

The authors' background as GPs and head physicians of out-of-hours GP cooperatives has made it possible to penetrate and understand the informants' stories and considerations. A nurse member of the research group might have opened more up for views disfavouring GPs. However, we perceived the conversations in the group interviews as open, and the informants spoke freely on conflicts between GPs and nurses.

All three authors have experienced out-of-hours work as busy and many of the consultations as medically unnecessary. In addition, we have found that busyness in the out-of-hours GP cooperatives leads to inappropriate antibiotic prescribing [4]. Our goal was to understand why nurses do not keep more callers out of the out-of-hours service, as it seemed to be a manageable task. This preconception was challenged when the informants revealed the complexity of their phone call assessments.

The findings of the current study form the basis of an educational intervention on respiratory tract infections for Norwegian phone triage nurses rolled out in out-of-hours GP cooperatives as part of an ongoing randomised controlled intervention.

Implications

For phone triage nurses, low urgency cases may be as difficult to handle as high urgency cases. Triage algorithms in triage scales offer little support for mild respiratory tract infections. Nevertheless, these conditions are drivers of busyness. Hence, the triage algorithms should be improved to give better decision support also for these. Nurses in the out-of-hours service have a demanding and challenging task in the health-care system as de facto gatekeepers, and their consensus-seeking approach enhances patient safety in out-of-hours GP cooperatives. Such a strategy, however, demands both skills and time. Stakeholders must consider this when they make training plans for nurses and in planning the organisational and financial model, as well as the staffing, of out-of-hours GP cooperatives.

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III

Effect of an educational intervention for telephone triage nurses on out-of-hours attendance: a pragmatic randomised controlled study

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Abstract

Background: Telephone triage has been established in many countries as a response to the challenge of non-urgent use of out-of-hours primary care services. However, limited evidence is available regarding the effect of training interventions on clinicians' telephone consultation skills and patient outcomes.

Methods: This was a pragmatic randomised controlled educational intervention for telephone triage nurses in 59 Norwegian out-of-hours general practitioners' (GPs) cooperatives, serving 59 % of the Norwegian population. Computer-generated randomization was performed at the level of out-of-hours GP cooperatives, stratified by the population size. Thirty-two out-of-hours GP cooperatives were randomised to intervention. One cooperative did not accept the invitation to participate in the educational programme, leaving 31 cooperatives in the intervention group. The intervention comprised a 90-minute e-learning course and 90-minute group discussion about respiratory tract infections (RTIs), telephone communication skills and local practices.

We aimed to assess the effect of the intervention on out-of-hours attendance and describe the distribution of RTIs between out-of-hours GP cooperatives and list-holding GPs.

The outcome was the difference in the number of doctor's consultations per 1000 inhabitants between the intervention and control groups during the winter months before and after the intervention. A negative binomial regression model was used for the statistical analyses. The model was adjusted for the number of nurses who had participated in the e-learning course, the population size and patients' age groups, with the out-of-hours GP cooperatives defined as clusters.

Results: The regression showed that the intervention did not change the number of consultations for RTIs between the two groups of out-of-hours GP cooperatives (incidence rate ratio 0.99, 95% confidence interval 0.91–1.07). The winter season's out-of-hours patient population was younger and had a higher proportion of RTIs than the patient population in the list-holding GP offices. Laryngitis, sore throat, and pneumonia were the most common diagnoses during the out-of-hours primary care service.

Conclusions: The intervention did not influence the out-of-hours attendance. This finding may be due to the intervention's limited scope and the intention-to-treat design. Changing a population's out-of-hours attendance is complicated and needs to be targeted at several organizational levels.

Keywords: Out-of-hours, telephone triage, nurse, educational intervention, respiratory tract infections, primary health care

Background

Out-of-hours primary care service is a crucial part of a well-functioning health care system, which provides health care when general practitioners' (GPs) offices are closed. The member countries of the Organisation for Economic Co-operation and Development have selected different models to provide this kind of service to their populations (1). GP cooperatives are the dominant model used in Europe (2).

The non-urgent use of out-of-hours service, both in primary care and emergency department setting, is of concern, because it may crowd out patients with the highest need and lead to inefficient use of resources (3-8). Telephone triage has been implemented in many countries as a response to the challenge of non-urgent use of out-of-hours service. However, evidence regarding the effect of this measure on the use of out-of-hours service is limited (7). Nevertheless, most European countries have implemented or improved the quality of telephone triage during the last 10 years (2).

Some countries, such as the UK, have a national telephone triage and advice system. Norway has one national telephone number for out-of-hours service; however, nurses in local out-of-hours GP cooperatives handle the calls from the local population. A review from 2017 suggested that more than 50% of calls to the telephone triage and advice system could be dealt with by providing telephone advice alone (9). However, only 23% of incoming calls to the Norwegian out-of-hours service are managed by nurses' telephone counselling alone (10).

High variation has been reported in measured appropriateness of advice provided by the telephone triage and advice services (9). High quality of nurses' telephone consultations positively affects the appropriateness of triage decisions, and a positive correlation exists between the duration of nurses' telephone consultations and the overall communication score (11, 12). Patient-centred communication, active listening and advising, as well as structured calls, may improve the quality of telephone triage (12).

Overall, telephone triage in out-of-hours care appears to be safe because high-risk patients are mostly identified and handled correctly (13). However, limited evidence is available regarding the triage of callers with mild-to-moderate symptoms, such as self-limiting acute respiratory tract infections (RTIs). These conditions are non-urgent and do not necessarily require medical attention out-of-hours, even in a primary care setting. They increase the workload and busyness in the out-of-hours care, which in turn may impair clinical quality of care, as demonstrated in the case of antibiotic prescription for RTIs (14). Telephone triage has the potential to reduce the workload of GPs (9). Nevertheless, telephone triage nurses are reluctant to call themselves gatekeepers to the out-of-hours GP cooperatives (15). They rather describe themselves as service providers who want to reach a consensus with the caller about the right level of care. They argue that such agreement is easier to reach if they have proper knowledge of the relevant guidelines. Consequently, a gap exists between the needs and expectations of stakeholders of primary health care as well as the needs of and reality experienced by telephone triage nurses.

Norwegian citizens are entitled to have a list-holding GP who offer planned and emergent service for their listed patients in-hour (16). The list-holding GPs are also obliged to work sessions in the out-of-hours service. Yet, other doctors such as locums and hospital doctors manage 42 % of the out-of-hours consultations (17). The municipalities organise their out-of-hours service according to local needs and geographical variations, alone or together with neighbouring municipalities. Forty-nine %

of the services cover more than one municipality (18). The median population size per out-of-hours service was 12823 (450-699827) in 2022 (19). Out-of-hours GP cooperative (with more than 15 doctors taking turns being on duty) is the most common model for organizing out-of-hours service, but rota groups (four to fifteen doctors) and individual GP practices (less than four doctors) are also common (2). A nurse or paramedic with a bachelor's degree is required to answer all incoming calls to the local out-of-hours service, and at least one medical doctor must be available for physical consultations 24/7 (20). There is no record on the number of doctors on duty, but the median number of nurses employed per out-of-hours service was 17.5 in 2018, with large variation (1->50) (21). In most services the nurses rotate between answering the telephone from the public and supporting the doctor in the clinical work. Primary care physicians, i.e., list holding GPs and other out-of-hours doctors, are mandatory gatekeepers to secondary health care 24/7. Patients pay a medical fee per consultation, which is 75 % higher out-of-hour than in-hour. When the maximum amount of 2921 NOK (295 Euros) per year is paid, any further consultations in the current year are free of charge.

High primary care physician continuity leads to lower costs in health care, fewer hospitalizations, and lower mortality (22, 23). Hence, one can argue that callers who can wait for the list-holding GP's opening hours should wait, including those with RTIs. A long-lasting doctor–patient relationship is a better basis for practising a restrained antibiotic prescribing attitude than a busy out-of-hours session (14). A transfer of 20% of patients from Norwegian out-of-hours service to day-time practice would lead to a 1.6% increase in the number of consultations for list-holding GPs (24). Despite work overload and recruitment problems in the Norwegian regular GP scheme, we believe that this increase would be manageable and pertinent (25).

Specific training may strengthen telephone triage nurses' gatekeeping capacity. However, insufficient evidence is available to conclude the effectiveness of interventions aimed at reducing emergency department attendance (26). Existing evidence is characterised by heterogeneous patient groups, unspecific target groups and the lack of control groups (26). A Cochrane report from 2017 concluded that more research assessing the effect of different training interventions on clinicians' telephone consultation skills and their effect on patient outcomes is needed (27).

The primary aim of this study was to assess the effect of an educational intervention about RTIs and communication skills for telephone triage nurses on out-of-hours attendance for RTIs. The secondary aims were to describe the distribution of RTIs between list-holding GPs and out-of-hours GP cooperatives and assess the intervention's effect on list-holding GPs' attendance.

Methods

Study design

This is a pragmatic randomised controlled educational intervention among Norwegian telephone triage nurses working in out-of-hours GP cooperatives. All Norwegian out-of-hours GP cooperatives that met our inclusion criteria were included in the study (Table 1).

Table 1 Inclusion criteria for out-of-hours GP cooperatives

1. Serving a population > 10 000 inhabitants
2. Advising the population to call the service on perceiving a need for medical attention out-of-hours
3. The telephone office answering the national telephone number for the out-of-hours service is localied inside the out-of-hours GP cooperative
4. Is managed by at least one nurse during evenings
5. Covers one or several entire municipalities (municipalities where the population adheres to only one out-of-hours GP cooperative)

The out-of-hours services in the two largest cities of Norway, Bergen, and Oslo, were not included owing to their policy of direct attendance. Out-of-hours cooperatives serving less than 10 000 inhabitants were excluded as they normally will have less than 6 consultations per 24 hours and therefore are less busy (28). Also, these cooperatives seldom have conflicts of simultaneity and are therefore less likely to use triage scales (18).

A total of 64 out-of-hours GP cooperatives serving 3.4 million inhabitants (median population size per out-of-hours GP cooperative 36.048, range 11.490–236.202) met the inclusion criteria and were randomized to intervention or control. An independent researcher performed the randomization using the RAND command in Microsoft Excel (2016) in November 2018, with stratification by the population size (small 10,000–40,000; large > 40,001).

We contacted the administration of the 32 out-of-hours cooperatives in the intervention group through e-mail or telephone and invited them to participate in a meeting during the annual leadership conference for the primary care out-of-hours service in Norway (Lederkonferansen 2019) in March 2019. In this meeting, we presented the educational intervention and explained how they could implement it locally without any external support. Nineteen persons from 16 out-of-hours GP cooperatives participated. BHL contacted the other 16 out-of-hours GP cooperatives, three by personal contact during the conference and the remaining via telephone calls after the conference. One of the 32 cooperatives refused to participate due to time constraint, while the other 31 accepted the invitation and were included in the study. Data from one out-of-hours cooperative in the intervention group, in addition to one out-of-hours cooperative and one municipality in the control group, were excluded from the study because of the merging of municipalities across the two groups during the study period. Data from two out-of-hours cooperatives (serving 180,989 inhabitants) in the control group were excluded because of data error. As a result, 59 out-of-hours GP cooperatives serving 59 % of the Norwegian population, were included in the intention-to-treat analysis (fig. 1).

Figure 1 Flow chart of out-of-hours cooperatives included and reasons for exclusion after randomisation

The intervention

The intervention consisted of two parts:

1. A 90 minute e-learning course about acute RTIs and general communication techniques for telephone triage nurses (see appendix A for the outline). The authors prepared the course based on preliminary data from a qualitative study on telephone triage nurses' assessment of RTIs (15).
2. A 90 minute group discussion for the telephone triage nurses. Dedicated local nurses led the group sessions based on a written guide (Appendix B) . The main elements were to discuss gained knowledge from the e-learning course and to discuss the unique activity reports for each out-of-hours GP cooperative (Appendix C). The reports described how the population attended each out-of-hours GP cooperative and the respective GP offices during 2018, with emphasis on acute RTIs. The guide and reports were prepared by BHL and SH and were based on data from Statistics Norway and aggregated data from the open database of the Norwegian Control and Payment of Health Reimbursement registry (29).

The intervention was piloted by ten telephone triage nurses at one out-of-hours GP cooperative in May 2019 and adjusted based on the feedback from these nurses.

The unique activity reports (Appendix C) were sent to the intervention cooperatives by mail and e-mail in September 2019. The e-learning course was launched password-protected on a web platform in October 2019, exclusively for the intervention cooperatives (30). We encouraged the local contacts to implement both parts of the intervention before December 2019. The pragmatic

intention-to-treat design implied no follow-up of the implementation. However, through the log-on function of the web platform, we could see how many nurses had participated in the e-learning course.

Variables

GP offices and out-of-hours GP cooperatives send electronic compensation claims to the Norwegian Health Economics Administration. The claims contain data on date and type of contact (phone, consultation, or home visit) with GP offices and out-of-hours GP cooperatives as well as age, gender, and diagnosis of the caller/patient. We retrieved these data from the National Directory of Health (29).

We did not have access to the number of nurses working in each out-of-hours cooperative during the intervention. The number of nurses who had just started or completed the e-learning course per 1000 inhabitants in each region was therefore used as a proxy for the proportion of trained nurses in each out-of-hours GP cooperative.

The primary outcome was the change in the number of out-of-hours doctor's consultations for RTIs per 1000 inhabitants in the intervention group versus the control group during the winter months before (December 2018–February 2019) and after (December 2019–February 2020) the intervention. The secondary outcomes per 1000 inhabitants during the same two periods were:

- the change in the number of list-holding GPs' consultations for all diagnoses
- the change in the number of list-holding GPs' consultations for RTIS
- the change in the number of telephone contacts for all diagnoses for list-holding GPs
- the change in the number of nurses' telephone consultations for all diagnoses in the out-of-hours GP cooperatives

We defined RTIs according to the International Classification of Primary Care, 2nd edition, as the following groups: 'respiratory symptoms' (R01–05, R08–09, R21 and R23–29), acute tonsillitis (R72 and 76), acute RTIs (R74), acute sinusitis (R75), acute laryngitis (R77), acute bronchitis (R78), influenza infection (R80), pneumonia (R81–82), 'other RTIs' (R71, R83 and R99) and ear infections (H01, H29, H70–72 and H74). We also defined the groups urinary tract infections (U01–02, U07, U13 and U70–72), 'other conditions' (A03, A76–78), 'unspecified' (A99) and 'all other diagnoses' (all International Classification of Primary Care codes not included in any of the above-mentioned groups).

Statistical analysis

We used frequencies and percentages to describe the distribution of the sample population and count data relating to contacts and consultations made in the control and intervention arms, and StataSE 17 (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC) for the statistical analyses.

The Poisson regression is the basic model used for modelling count data. It assumes that the mean and the variance of the count variable are approximately equal. We checked this model assumption using the dispersion statistic, which should be equal to one. However, our Poisson model

output gave the dispersion statistic equal to 24.2. In addition, the appropriateness of the negative binomial model over the Poisson regression model was checked using the Bayesian information criterion (BIC), which states that the model with the smaller BIC estimate is preferred over the model with a larger BIC. The negative binomial model had the smaller BIC estimate. Thirdly, we obtained a Z score test of 16.1, with a t-probability < 0.01. This test evaluates whether the data are Poisson or negative binomial. Based on this result, we rejected the null hypothesis of no overdispersion in the data. Further, we used the likelihood-ratio test of alpha=0, to test if the dispersion parameter, was equal to zero, which would have reduced the model to a Poisson regression. Our results showed that alpha was significantly greater than zero. This implies than the data were over-dispersed, hence using the negative binomial model instead of the Poisson model was appropriate.

The negative binomial regression model was used with random effects at the level of out-of-hours GP cooperatives to check for any baseline differences between the two groups (table 2) and for the primary (table 3) and secondary outcomes. The model was adjusted for the number of nurses who had only started or completed the e-learning course (per 1000 inhabitants), the population size and patients' age groups, with the out-of-hours GP cooperatives defined as clusters. We also run a three-way interaction model as a sensitivity analysis for the variable of the number of nurses who had started or completed the e-learning course (per 1000 inhabitants).

We obtained estimates of incidence rate ratios (IRRs) for the negative binomial regression model. An IRR > 1 indicates an increase in counts in one group relative to the reference group or one period relative to the reference period, whereas an IRR < 1 indicates a decrease in these parameters. An IRR = 1 indicates no difference in the number of counts between the groups or periods.

Results

Population and epidemiology at baseline

The 59 out-of-hours cooperatives served 3.12 million inhabitants (59% of the Norwegian population) in 198 (of 356) municipalities. There were 4.72 million contacts in primary health care in these municipalities in the baseline period, of which 4.37 million were list-holding GPs' consultations and 0.35 million were GP consultations in the out-of-hours service.

Women constituted 52.5% and 57.8% of the patients who received service in out-of-hours cooperatives and GP offices, respectively. Patients were relatively younger in the out-of-hours cooperatives than in the GP offices (Fig. 2).

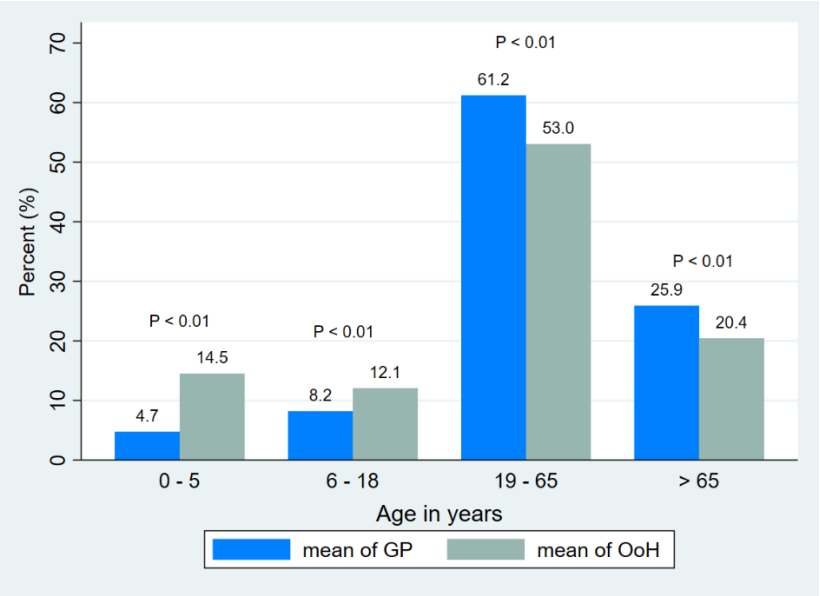

Figure 2 Proportion of age groups in GP offices and out-of-hours GP cooperatives, all diagnoses. P-values obtained from Chi-square test.

For RTIs, 34.4% and 16.5% of children under 5 years of age received a diagnosis in out-of-hours cooperatives and GP offices, respectively (Fig. 3).

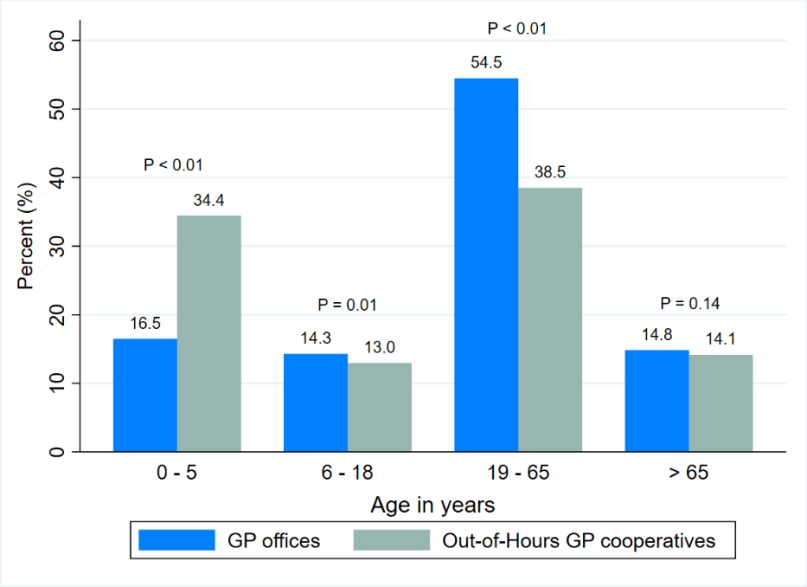

Figure 3 Proportion of age groups in GP offices and out-of-hours GP cooperatives, RTIs. P-values obtained from Chi-square test.

Respiratory symptoms and acute upper RTI were the two most frequently diagnosed RTIs (Fig. 4), and 13.9% of all RTIs were diagnosed in out-of-hours cooperatives.

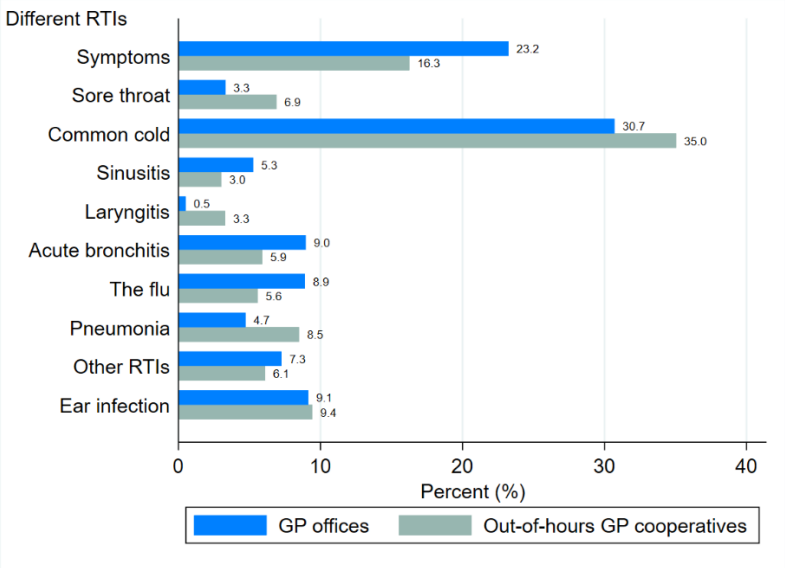

Figure 4 Proportion of different RTIs in GP offices and out-of-hours GP cooperatives. All the differences between GP offices and out-of-hours GP cooperatives, except for ear infections, were statistically significant (p<0.05, Chi square test).

The proportion of RTIs diagnosed was higher in out-of-hours cooperatives than in the GP offices (22.9% versus 14.0 %). Laryngitis, other conditions (viral RTIs frequently diagnosed in children) and sore throat were the most common diagnoses in the out-of-hours GP cooperatives (Fig. 5).

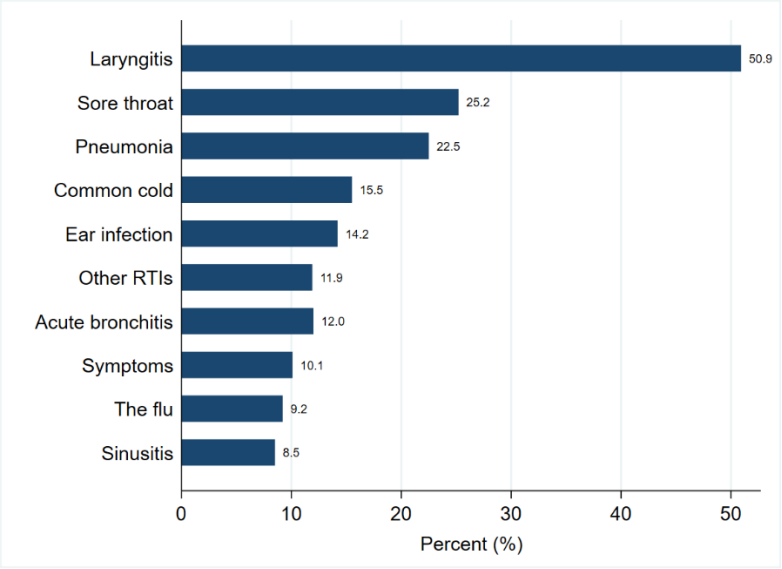

Figure 5 Proportion of conditions diagnosed in out-of-hours GP cooperatives

Effect of the intervention

At baseline, no significant difference was observed between the intervention and control groups with regard to how the out-of-hours GP cooperatives and the list-holding GPs were used by the population (Table 2).

Table 2 Characteristics of the groups and adjusted estimates of IRR and their 95% CIs obtained from the negative binomial regression model showing the differences in counts between the groups at baseline

	Control	**Per 1000 inhabitants**	**Intervention**	**Per 1000 inhabitants**	**IRR (95% CI, ref. control)**
Number of out-of-hours GP cooperatives	29		30		
Population	1557545		1561723		
Total number of all contacts for out-of-hours cooperatives and list-holding GPs	2361584	1516	2361666	1512	0.97 (0.92–1.03)
Number of consultations for all diagnoses for out-of-hours cooperatives	103772	67	109859	70	0.94 (0.83–1.06)
Number of RTI consultations for out-of-hours cooperatives	23589	15	25321	16	0.97 (0.82–1.13)
Number of consultations for all diagnoses for list-holding GPs	1077563	692	1098182	703	0.99 (0.94–1.05)
Number of RTI consultations for list-holding GPs	152536	98	151179	97	1.04 (0.96–1.13)

CI, confidence interval; GP, general physician; IRR, incidence rate ratio; RTI, respiratory tract infection. The model was adjusted for the number of nurses participating in the e-learning course, population size and patients' age groups, with the out-of-hours GP cooperatives defined as clusters

By the end of November 2019, 286 nurses (61% of registered participating nurses) had completed the e-learning course. The negative binomial regression showed that the intervention led to no significant difference in the number of consultations for RTIs between the out-of-hours GP cooperatives in the intervention and control groups (IRR 0.99, 95% CI 0.91–1.07; Table 3).

Table 3 Adjusted estimates of IRR and their 95% CIs obtained from the negative binomial regression model showing the differences in counts between the groups before and after the intervention			
		Before	**After**
Number of RTI consultations in the out-of-hours GP cooperatives	Control	23589	22956
	Intervention	25321	25245
	Difference	1732	2289
	IRR (95% CI, ref. control)	0.97 (0.82–1.13)	0.95 (0.82–1.11)
Difference in number of RTI consultations between the two groups after the intervention, ref. control	Numbers of consultations (ref. control)		557
	IRR (95% CI, ref. control)		0.99 (0.91–1.07)

CI, confidence interval; IRR, incidence rate ratio; RTI, respiratory tract infection. The model was adjusted for the number of nurses participating in the e-learning course, population size and patients' age groups, with the out-of-hours GP cooperatives defined as clusters. The model indicates that there is no difference in the number of RTI consultations between the two groups after the intervention.

The intervention did neither result in significant differences with regard to the number of telephone consultations for RTIs for out-of-hours GP cooperatives (IRR 0.83, 95% CI 0.66–1.07), the number of list-holding GPs' consultations for all diagnoses (IRR 0.98, 95% CI 0.95–1.01) or RTIs (1.00, 95% CI 0.94–1.06) nor for telephone consultations for all diagnoses for list-holding GPs (IRR 1.02, 95% CI 0.97–1.07) or out-of-hours GP cooperatives (IRR 0.97, 95% CI 0.86–1.10).

The three-way interaction effect that could have explained how the slope of the number of RTI-consultations varies as a function of nurses per 1000 inhabitants who attended the e-learning course per study time and study group could not be estimated, as illustrated in the margins plot in figure 6.

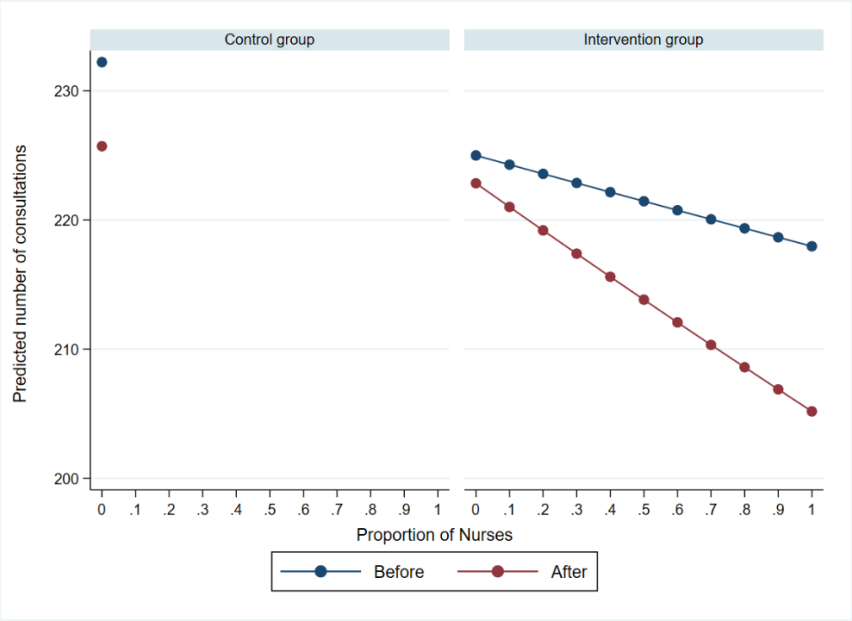

Figure 6 Predicted number of RTI-consultations in the out-of-hours GP cooperatives as a function of the number of nurses per 1000 inhabitants who started or completed the e-learning course per study time and group.

Discussion

The patient population attending the out-of-hours service during the winter season was younger and had a higher proportion of RTIs than the population attending the regular GP offices. The educational intervention about RTIs and communication skills for telephone triage nurses did not decrease the number of consultations for RTIs in the out-of-hours GP cooperatives.

Population and epidemiology at baseline

The out-of-hours patient population is characterized by a higher proportion of children and teenagers compared with list-holding GPs' patient population, especially for RTIs. Danish parents reported a perceived need for prompt action, unpleasant symptoms and worry as some of the main reasons for contacting the out-of-hours service (31). This is coherent with a high rate of out-of-hours consultations for the youngest children, because they often become abruptly ill with unpleasant symptoms. Nevertheless, generally harmless conditions and insecurity concerning the assessment of respiratory symptoms of their own children may lead parents to call the out-of-hours service. Telephone triage nurses describe this group of callers as challenging, and the parents' high degree of worry will often overrule the nurses' medical assessment, contributing to a high consultation rate for children (15).

The proportion of sore throat diagnosed in the out-of-hours cooperatives is high. In our data, sore throat is consistent with suspected or detected streptococcal tonsillitis. There is a strong Norwegian tradition of performing rapid strep A test and initiating treatment with penicillin V if streptococci are confirmed. This tradition may contribute to high expectations in the population of a doctors' assessment for sore throat, leading to high out-of-hours consultation rates (15).

Acute laryngitis is a hyperacute condition and tends to arise during night-time. Therefore, the high proportion of patients being diagnosed with this condition out-of-hours is unsurprising. However, the proportion of sinusitis cases was low. This finding is consistent with the low-urgency nature of sinusitis and the existing guidelines recommending a wait-and-watch attitude for this condition (32).

Effect of the intervention

Dutch GPs believe that a stricter triage and annual feedback to triage nurses will reduce the number of non-urgent visits to the out-of-hours cooperatives (8). This viewpoint is supported by a Finnish training intervention among nurses in an emergency unit that improved the quality of telephone triage as measured using self-administered questionnaires (33). Self-reported increase in quality as measured using questionnaires may be an indication of quality improvement, but the lacking patient outcome is a major weakness of this and other studies on educational interventions for telephone triage nurses (27). The present study meets the need for data on patient outcome. However, the intervention would have benefited from a process analysis to evaluate whether it made the nurses more confident in assessing callers with symptoms of mild-to-moderate RTIs.

The decision to seek health care is a complex process influenced by several factors, such as personal, social, and cultural, as well as characteristics of the health care system (4, 34). An introduction of school requirement for a sick leave certificate for teenagers led to increased list-

holding GP attendance and may contribute to out-of-hours health seeking behaviour (35). Convenience considerations and GPs' low capacity for urgent, same-day consultations may be other reasons for seeking help out-of-hours (31, 36, 37). Moreover, social network is also an important determinant for help seeking behaviour regarding antibiotic use (38). Telephone triage nurses described the fee-for-service plan for GPs working in the out-of-hours cooperatives as a perverse incentive, pushing non-urgent consultations out-of-hours (15).

Hence, there may be several reasons for the lacking effect of our educational intervention on the primary and secondary outcomes. Strategies aimed at reducing out-of-hours attendance by improving the skills of individual nurses imply that they perform an active gatekeeping role, keeping low-urgency patients out of the cooperatives. From this perspective, an educational intervention similar to the one described in the present study could be expected to have a direct effect on the out-of-hours attendance, particularly because nurses report that the decision regarding the need for a doctor's consultation is generally made in co-operation between the nurse and caller (15).

However, our e-learning course and group discussion of 90 minutes each may be too limited to oust the external factors telephone triage nurses describe as decisive and non-controllable. (15). This point of view is supported by a Swedish study that concluded that multiple organizational factors, including the triage performed and the self-care advice provided by the nurses, play an important role in primary health care centres where antibiotic prescribing is low (39). Hence, keeping non-urgent patients from doctors' consultations out-of-hours is not a simple decision for one particular nurse. As for the problem of crowding in emergency departments in hospitals, the challenge might be better addressed through system changes (40).

Methodological considerations

The data from the Norwegian Directory of Health are reliable and a good source of information about the study population as well as activity in primary health care (37). Our study covers almost 60% of the Norwegian population, indicating high external validity in health care systems similar to the Norwegian health care system. We consider the data to be a reliable source of information about the epidemiology of RTIs during the two winter seasons. The first Norwegian case of coronavirus disease 2019 appeared on 26 February 2020, i.e., towards the end of the intervention period (41). Hence, the effect of the coronavirus disease 2019 pandemic on the data is limited.

The large proportion of the population being covered by the included out-of-hours GP cooperatives, in addition to narrow confidence intervals, indicate that the present study has statistical power to answer our research question.

The e-learning course encouraged the nurses to not overrule the triage system in use in their own out-of-hours GP cooperative. Because many triage systems are less specific with regard to RTIs, generally with high sensitivity and low specificity for serious disease, this may have been an obstacle for change (42). In this way, the e-learning course may have contributed to the nurses feeling more confident, without leading to a decrease in the number of callers being assigned a doctor's consultation.

The pragmatic intention-to-treat design yielded limited control on the implementation of the intervention. We do not know how many nurses completed the two educational parts, and how

many nurses had access to the course without attending it. This makes the assessment of the effect of the intervention more uncertain. To compensate for this weakness, we included the number of nurses who had started on or completed the e-learning course per 1000 inhabitants as a variable in the regression model. This variable did not have a significant effect (IRR 0.98, 95 % CI 0.80 – 1.19). The sensitivity analysis of this variable was not possible to perform, since the nurses in the control group were not exposed and the proportion of nurses in this group is zero.

A longer intervention period might have increased the likelihood of a higher participation rate among nurses, but it would also increase the risk of external bias from the coronavirus disease 2019 pandemic. Hence, it is difficult to conclude about a lacking effect of the intervention based only on the primary and secondary outcomes. A pragmatic design is closer to real life and health care. We therefore considered it a pertinent method.

Conclusion

The described educational intervention for telephone triage nurses did not influence the out-of-hours attendance for RTIs or list-holding GPs' attendance. Changing a population's health service attendance is complicated, and the intervention's pragmatic design with a lack of control on the proportion of participating nurses, and its limited scope, may be reasons for the missing effect on the primary and secondary outcomes. Future studies on educational interventions should include a process evaluation, be planned for a longer period, and involve both health planning councils and leaders at different levels, as well as GPs and nurses in out-of-hours cooperatives. Furthermore, a need exists to explore the perspective of callers with RTIs who are advised to wait-and-watch or seek their list-holding GPs to reduce non-urgent use of the out-of-hours service.

Abbreviations

CI: Confidence interval; GP: General practitioner; IRR: Incidence rate ratio; RTIs: Respiratory tract infections

Declarations

Ethics approval and consent to participate

The study protocol was assessed by The Regional Committee for Research Ethics (2018/1080/REK sør-øst C), which concluded that the study, according to the Norwegian Act on medical and health research, did not need ethical approval (43). The Norwegian Data Protection Authority approved the use of the data in this project (542881). The leaders of each out-of-hours GP cooperative in the intervention group gave consent on behalf of the participating nurses, and they informed the local nurses about the study. The consent form was approved by The Norwegian Data Protection Authority. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The raw data analysed during the current study contains person sensitive information and publication of these data has not been approved by The Norwegian Data Protection Authority. However, a modified dataset is available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors contributed to the study design and the educational intervention. IKR identified the out-of-hours cooperatives that met the inclusion criteria. BHL administrated the intervention, prepared the raw data for analysis, and performed the analysis with support from SH. All the authors contributed to the interpretation of the findings. BHL wrote the initial manuscript draft. All the authors reviewed and refined the manuscript and have approved the final version.

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Appendix A – consent to participate paper 1 (Norwegian)

Forespørsel om deltakelse i forsknings- og kvalitetssikringsprosjekt ved legevakta

Vi ønsker å undersøke hvor mye bred- og smalspektret antibiotika vi forskrev ved Hedmarken interkommunale legevakt og Tønsberg legevakt i 2014. Dette er en naturlig del av kommunens plikt til å drive med kvalitetssikring, i tillegg til at det er grunnlag for et forskningsprosjekt finansiert ved et allmennpraktikerstipend for Bent H. Lindberg.

En viktig forutsetning for å kunne gjennomføre prosjektet, er at hver enkelt lege som tok vakter ved Hedmarken interkommunale legevakt og Tønsberg legevakt i 2014 gir tillatelse til at følgende data hentes ut anonymisert ved en spørring i WinMed Statistikk:

-dato og konsultasjonsvarighet
-diagnose
-eventuell forskrivning av antibiotika og type antibiotika
-pasientens kjønn og alder
-bruk og resultat av hurtigtester

Regional etisk komité og Personvernombudet for forskning har godkjent studien.

Hensikten med datainnsamlingen er å se på antibiotikaforskrivning på makroplan. Det er verken mulig, hensiktsmessig eller ønskelig å studere enkeltleger. Alle data vil bli konfidensielt behandlet og anonymisert i hele prosessen ved at hver lege tildeles et nummer som ikke er kjent for noen av de involverte personene på noe stadium i studien.

Vi ber om at du aksepterer at dine data blir brukt ved at du signerer på samtykkeskjemaet og returnerer på en av følgende 3 måter innen 2 uker fra du har mottatt dette brevet:

1) Bruk vedlagte, frankerte svarkonvolutt
2) Skann og send på e-post til post@hedmarken-legevakt.nhn.no
3) Lever på legevakta når du har vakt
Hvis vi ikke hører fra deg, vil vi tillate oss å purre.
På forhånd takk for din deltakelse!

Med vennlig hilsen

Mats Foshaug	Bent Håkan Lindberg	Sigurd Høye
Legevaktoverlege	Hedmarken legevakt	Avd. for allm.med. Universitetet i Oslo

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Jeg godtar at mine data brukes til forskninsformål i henhold til beskrivelsen over.

Sted	Signatur	Stempel/blokkbokstaver

Appendix B – Invitation to participate paper 2 (Norwegian)

Invitasjon til å delta i gruppeintervju om sykepleieres rolle på legevakt.

Til utvalgte deltakere ved Den nasjonale legevaktkonferansen 2018.

Vi ønsker å komme i kontakt med sykepleiere som håndterer telefonhenvendelser til legevakt. Hvis dette ikke gjelder deg, kan du se bort fra denne henvendelsen.

Sykepleieres kompetanse og innsats ved norske legevakter er helt unik. Å sitte i frontlinjen og sile henvendelser per telefon er faglig krevende. En av de vanligste henvendelsene til legevakt er luftveisinfeksjoner. Sykepleiers rolle i vurderingen av disse pasientene er det forsket for lite på. Det vil vi endre, og vi håper du har lyst til å være med!

Denne invitasjonen sendes til et utvalg av sykepleiere som er påmeldt Den nasjonale legevaktkonferansen 2018, og det skjer i samråd med Norsk legevaktforum og den lokale arrangementskomiteen. Din stemme er viktig, og vi vil gjerne lytte til hva du har å si om din erfaring med telefonkontakt med pasienter med luftveisinfeksjoner som ringer legevakten. Vi vil derfor invitere deg til et gruppeintervju om dette temaet. I samarbeid med arrangementskomiteen har vi valgt tidspunkter hvor du ikke mister viktige faglige foredrag, og det er også avklart at man ikke mister kurspoeng ved å delta. Intervjuene vil finne sted enten torsdag 6. september kl. 14-1530 eller fredag 7. september kl. 16-17.30 på konferansehotellet.

Hva får du ut av dette? Du får muligheten til å reflektere rundt ditt eget fag i gruppe med andre legevaktsykepleiere, og du bidrar til å belyse din yrkesgruppes innsats og betydning i dette fagfeltet. I tillegg vil resultatene få betydning for framtidige kurs og kvalitetsarbeid for sykepleiere på legevakt.

Hva må du gjøre for å være med? Vi trenger din påmelding per e-post til b.h.lindberg@medisin.uio.no, eller per tekstmelding/telefon til 40 220 320. Gi gjerne beskjed om hvilket av tidspunktene du foretrekker. I tillegg er det fint om du leser vedlagte informasjonsbrev og signerer på samtykkeskjemaet. Vi tillater oss å purre per tekstmelding hvis vi ikke hører fra deg i løpet av noen dager.

Ta kontakt hvis du har spørsmål, per e-post eller telefon.

Vi håper du vil bidra!

Med vennlig hilsen

Bent Håkan Lindberg
Forsker, Antibiotikasenteret for primærmedisin (ASP)/UiO

Sigurd Høye
Post.doc. ASP/UiO

Ingrid Keilegavlen Rebnord
Ph.D./forsker ved Nasjonalt Kompetansesenter for legevakt-medisin

Appendix C – interview guide (Norwegian)

Velkommen til dette fokusgruppeintervjuet. Vi er veldig glad for at dere stiller, og vi tror den informasjonen dere vil bidra med i dag, vil ha betydning for deres og vårt fag, i tillegg til at det vil ha betydning for framtidig forskning. Tidsrammen for møtet er 90 minutter, og det er min jobb å passe på at vi blir ferdige til riktig tid.

Jeg vil minne om taushetsplikten. Snakk gjerne om konkrete hendelser, men ikke bruk pasientnavn eller andre detaljer som gjør at det er mulig å gjenkjenne personen det gjelder.

Da regner jeg med at det er greit for alle at vi tar opp det som blir sagt, og da setter vi i gang lydopptakeren. Når *materialet publiseres, vil vi verken oppgi navn eller hvilke legevakter som har deltatt, og dermed forblir det dere sier anonymt. Vi vil ikke rapportere noe til ledelsen ved legevakta. Når prosjektet er ferdig, vil lydfilen slettes, og listen over deltakere vil makuleres.*

Vi kaller møtet i dag for et fokusgruppeintervju. Som dere vet, er temaet sykepleiers rolle ved hastegradsvurdering av luftveisinfeksjoner. Vi ønsker er at samtalen skal foregå mest mulig mellom dere som er deltakere, og konkrete fortelleringer er det veldig fint å få høre. Vi kommer til å lansere noen temaer underveis. Ikke vær redd for å assosiere eller å havne på sidespor. Når samtalen havner for langt utenfor temaet, kommer jeg til å hente dere inn. Det er ingen riktige eller gale svar. Det er deres erfaring og holdninger vi ønsker å høre mer om.

Er det noen spørsmål så langt?

Det første temaet vi skal snakke om, er hvordan du opplever rollen som sykepleier på legevakta når pasienter med luftveisinfeksjoner eller luftveissymptomer ringer til legevakta.

1. *Hvilke tanker har du om de telefonsamtalene som handler om luftveisinfeksjoner eller luftveissymptomer? Det vil si hoste, feber, snørr, vondt i halsen osv.*
    a. *Hva er dine erfaringer med å komme i skvis mellom pasientens ønske/forventning og legevaktens mulighet eller faglighet?*
    b. *Får de fleste pasientene time? Eller er det noen som klarer seg med råd?*
    c. *Hvordan opplever du samarbeidet med legene rundt denne pasientgruppen? I hvilken grad påvirker legenes ønsker hvor mange du tildeler time på legevakta?*
    d. *Hvordan er det å spørre legevaktlegen om faglige råd? Hva hindrer deg eventuelt i å gjøre dette?*

Kasuistikk 1: Det er torsdag ettermiddag. Klokken er 5. Det er en travel vakt. Foreldrene til Per på 17 år ringer. Han har fått en lei hoste som har vart i 1,5 uke. De vil gjerne at han blir undersøkt av lege. Han har ikke feber, men han sover dårlig om nettene fordi han hoster mye. Han tror ikke han orker å gå på skolen dagen etter, og han trenger lege-erklæring til skolen.

Kasuistikk 2: Det er tirsdag ettermiddag. Dr. Karlsen har vakt. Han er en hyggelig lege som alltid er positiv, blid og arbeidsvillig. I dag signaliserer han at han er sliten og helst vil ha en rolig vakt. Rikard, 59 år, ringer. Han føler seg slapp og sliten, hoster intenst. Har målt temperaturen under armen til 38,6. Klarer å drikke, men han orker ikke spise, og han holder sengen.

2. Hva er årsaken til at tilsynelatende ganske friske pasienter settes opp til time på legevakta? (her kan man vurdere å gå rett på 2a)

a. Hva har du inntrykk av er årsaken til at ganske friske folk, med milde til moderate luftveisinfeksjoner ringer legevakta for time?
b. Hva tror du er årsaken til at folk med milde til moderate pasienter settes opp til time på legevakta?
c. fortell om en episode hvor du tildelte en pasient en konsultasjon på legevakta, men hvor du selv mente at det ikke var nødvendig ut fra en medisinsk vurdering
d. hva gjør du når du ikke når fram hos pasienten?

Kasuistikk 3: Ole ringer onsdag kl 2245. Han har vondt i halsen og har hatt feber i to dager. Han er redd han har fått streptokokker og ber derfor om time på legevakta.

Kasuistikk 4: Lise er 40 år. Hun har vært forkjølet i 4 dager. De siste 2 dagene har hun hatt smerter i bihulene, selv om hun har brukt nesespray og paracet. Det er mange ledige timer på legevakta, og legen har sagt at hun gjerne tar mange pasienter. Hvordan opplever du denne situasjonen?

3. Hvilke erfaringer har du med å gi råd til pasienter med luftveisinfeksjon?
    a. hva gjør deg trygg på at pasienten kan klare seg med et råd?
    b. Hva gjør deg utrygg på at pasienten kan klare seg med et råd?
    c. hvordan får du pasienten med på å avvente situasjonen?
    d. Er det noe spesielt du sier som gjør at du opplever at pasientene føler seg trygge?
    e. Erfaring med pasienter som i utgangspunktet ønsket time, men hvor dere i løpet av telefonsamtalen ble enige om at time ikke var nødvendig?
    f. Noen har fortalt at de nærmest forhandler med pasientene hvis de ikke blir enige. Er det noe dere har erfaring med? Er målet alltid at dere skal bli enige?

Kasuistikk 5: Mor ringer vedrørende Ole på 2 år. Han har hatt feber i 3 dager. Han spiser og drikker godt, men han vil ikke leke som vanlig. Han foretrekker å sitte på fanget. Han har ikke utslett. Han sover dårlig om nettene. Mor er engstelig.

4. Hvilke faktorer hindrer deg i å anbefale pasienten å se an situasjonen til fastlegekontoret åpner? Hvilke faktorer fremmer en slik strategi?
    a. hva skal til for å gjøre telefonvurderingen tryggere for deg som sykepleier?
    b. hvilke farer ser du ved å ikke tilby time til pasienter med luftveisinfeksjon?
    c. Hvordan forebygger du risiko når du ikke setter opp til time?
    d. Erfaring med tilsynsmyndighetene?

Kasuistikk 6: Mohammed ringer påskeaften. Han er 53 år og har feber, forteller han. Han vet ikke hvor høy temperaturen er. Han har vondt i hodet og sier han må få treffe en lege.

Appendix D – Concent to participate paper 2 (Norwegian)

Forespørsel om deltakelse i forskningsprosjektet

«Legevaktsykepleieres erfaring med og holdning til telefonisk hastegradsvurdering og rådgivning ved luftveisinfeksjoner på legevakt – en kvalitativ studie.»

Dette er et spørsmål til deg om å delta i et forskningsprosjekt i regi av Antibiotikasenteret for primærmedisin ved Universitetet i Oslo, der hensikten er å utforske legevaktsykepleieres erfaring med og holdning til telefonisk hastegradsvurdering og rådgivning ved luftveisinfeksjoner på legevakt.

Bakgrunn og formål

Sykepleieres portvaktfunksjon for primærhelsetjenesten har fått lite oppmerksomhet når det gjelder primærhelsetjenestens kvalitet generelt, og for riktigere bruk av antibiotika spesielt. En kvalitativ studie blant sykepleiere, slik vi planlegger, vil gi økt innsikt i legevaktens funksjon som portvakt og forskriver av antibiotika mot luftveisinfeksjoner. Dette vil være viktig med tanke på framtidig forskning med fokus rettet mer direkte mot å få ned unødvendig antibiotikaforskrivning i denne delen av helsetjenesten.

Formålet med studien er å utforske hvilke holdninger og erfaringer legevaktsykepleiere har med å hastegradsvurdere og gi råd til innringere med luftveisinfeksjon på legevakt. Dette vil vi gjøre ved å invitere utvalgte sykepleiere fra et representativt utvalg legevakter fra hele Norge, til å delta i fokusgruppeintervjuer.

Denne studien er en del av Bent Håkan Lindbergs phd-prosjekt «Bruk av legevakt ved luftveisinfeksjoner», som utgår fra Antibiotikasenteret for primærmedisin ved Universitetet i Oslo i samarbeid med Nasjonalt kompetansesenter for legevaktmedisin i Bergen.

Hva innebærer deltakelse i studien?

Vi vil be deg om å være med i en fokusgruppe hvor deltakerne snakker sammen om sine erfaringer med å hastegradsvurdere luftveisinfeksjoner på legevakt. Fokusgruppeintervjuet vil vare i sirka 90 minutter og bli ledet av forskerne Bent H. Lindberg og Sigurd Høye. Intervjuene vil bli tatt opp, og i ettertid vil alt som ble sagt skrives ned. Teksten vil bli analysert etter vanlig metode for kvalitativ forskning. Vi vil gjennomføre 4 slike gruppeintervjuer, med til sammen 15-25 sykepleiere.

Hva skjer med informasjonen om deg?

Alle personopplysninger vil bli behandlet konfidensielt. Prosjektet skal ende med en artikkel som skal publiseres i et internasjonalt tidsskrift. Enkeltpersoner eller enkeltlegevakter vil ikke kunne

identifiseres i artikkelen. Det vil i ettertid ikke være mulig å knytte dine utsagn i intervjuene til deg som person. Når datainnsamlingen er over, vil vi, på gruppenivå, bare sitte igjen med opplysninger om kjønn, alder, sted og type legevakt for deltakerne. Navn og fødselsdato vil slettes for alltid.

Informasjonen som registreres om deg skal kun brukes slik som beskrevet i hensikten med studien. Du har rett til innsyn i hvilke opplysninger som er registrert om deg og rett til å få korrigert eventuelle feil i de opplysningene som er registrert. Koblingsnøkkelen med direkte personidentifiserende opplysninger vil lagres adskilt fra innsamlet datamateriale.

Prosjektleder har ansvar for den daglige driften av forskningsprosjektet og at opplysninger om deg blir behandlet på en sikker måte. Datamaterialet vil anonymiseres ved prosjektslutt. Dette innebærer at lydopptaket og koblingsnøkkelen slettes ved prosjektslutt, senest 31.12.2023.

Frivillig deltakelse
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert. Dersom du ønsker å delta eller har spørsmål til studien, ta kontakt med Bent Håkan Lindberg på tlf. 40220320 eller per e-post b.h.lindberg@medisin.uio.no

Studien er meldt til Personvernombudet for forskning, NSD - Norsk senter for forskningsdata AS.

Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

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(Signert av prosjektdeltaker, dato)

Appendix E – invitation letter to the information meeting (Norwegian)

Invitasjon til tematorg under Lederkonferansen 2019.

Infeksjoner i luftveiene utgjør mer enn 15 % av alle henvendelser til legevakt. Dette er ofte pasienter med lav hastegrad, men vurdering per telefon kan være utfordrende. Legevaktsykepleiere opplever denne telefonvurderingen som vanskelig og ønsker mer kompetanse på dette området, ifølge en intervjuundersøkelse vi har gjennomført.

Nasjonalt kompetansesenter for legevaktmedisin og Antibiotikasenteret for primærmedisin har derfor samarbeidet om å lage et gratis undervisningsopplegg for sykepleiere som betjener legevaktstelefon. Et utvalg på 32 legevakter vil i løpet av våren få tilbud om å ta dette i bruk fra høsten 2019. Målet med undervisningsopplegget er å øke sykepleiernes kompetanse på luftveisinfeksjoner og telefonvurderingen av disse.

Undervisningen består av to deler:

1. Et interaktivt e-læringskurs på 2x45 minutter som skal gi økt kompetanse i å skille mellom alvorlige og mer banale luftveisinfeksjoner. Kommunikasjon per telefon er hovedtema, i tillegg vil kurset gi oppdatert kunnskap om luftveisinfeksjoner.
2. Et gruppeopplegg skreddersydd for den enkelte legevakts interne fagdag. Legevakten vil få tilsendt et veiledningshefte som tar dere gjennom fagdagen. Det vil inneholde relevant statistikk for deres legevakt og temaer som vil danne utgangspunkt for en 2 x 45 minutters gruppesamtale ledet av fagsykepleier eller legevaktsjef. Lengden på gruppesamtalen kan imidlertid forkortes og tilpasses den tiden den enkelte legevakt har til disposisjon.

For å forberede dere på dette undervisningsopplegget, inviterer vi til en parallellsesjon under lederkonferansen for legevakter 2019 hvor vi vil presentere opplegget og svare på spørsmål. Vi anbefaler sterkt at den hos dere som kan være ansvarlig for gjennomføringen av fagdagen, melder seg på denne parallellsesjonen. Den vil bare være åpen for de legevaktene som er invitert, og det må derfor oppgis følgende kode i påmeldingen i feltet «Skriv inn forslag til ønsket tema»: ASP2019.

Vi tror parallellsesjonen og selve kursopplegget vil være både spennende og nyttig for din legevakt. Vi kommer til å minne deg på denne invitasjonen pr telefon eller mail.

Ta kontakt hvis du har spørsmål, per e-post eller telefon.

Med vennlig hilsen
Bent H. Lindberg
Antibiotikasenteret for primærmedisin
Universitetet i Oslo
b.h.lindberg@medisin.uio.no
Tlf: 40220320

Sigurd Høye
Antibiotikasenteret for primærmedisin
Universitetet i Oslo

Ingrid K. Rebnord
Nasjonalt kompetansesenter for legevaktmedisin, NORCE Norwegian Research Centre AS

Appendix F (Translated from the original Norwegian version):

Respiratory tract infections in the out-of-hours service – report for the year 2018

Consultations with list-holding GPs and out-of-hours in XXX out-of-hours GP cooperative's area

Antibiotikasenteret for primærmedisin (ASP)

NORCE
Nasjonalt kompetansesenter for legevaktmedisin (NKLM)

About the report

In this report, we show how the out-of-hours medical service and the GP service are used in your out-of-hours care area, compared to the whole country. The report shows figures for the year 2018.

We show both total figures for all diagnoses, and more specifically for respiratory tract infections. We also show figures for different age groups and for different contact types (i.e. consultations/home visits and counselling by telephone).

The purpose of this report is to initiate a conversation about how your out-of-hours GP cooperative is used by the population of the area. Of course, there is no answer as to how out-of-hours and GP services should be used, and there can be many reasons why the use in your area is different from its use in the rest of the country. Perhaps the report could still lead you to find out that you will try to bring about a change. If so, it is important to discuss measures that can bring the desired change.

The report is based on data from the KPR-register. All the data we have used are publicly available: https://helsedirektoratet.no/statistikk-oganalyse/statistikk-fra-kommunalt-pasient-og-brukerregister-kpr The data is collected from the electronic compensation claims submitted from GPs, out-of-hours doctors and out-of-hours GP cooperatives. Although there will always be some errors in such registry data, KPR data is considered good. We therefore believe the report is trustworthy. However, there may be systematic differences between different out-of-hours GP cooperatives when it comes to submitting electronic compensation claims. For example, some cooperatives may routinely charge 1bd ("Simple patient contact by paper letter or phone call") every time the nurse gives advice by phone, while other cooperatives do not have such a routine. This will of course be reflected in the report.

Respiratory tract infections is a common term for infections of the nose, pharynx, larynx, trachea, bronchi and lungs. In primary care, one works in different conditions than in hospitals, and the diagnosis itself can be somewhat more uncertain and inaccurate. When using symptom diagnoses (e.g., R05 Cough), it may reflect that one is unsure what kind of infection causes the symptom in question. However, it is always a goal to make the most accurate diagnosis (e.g., R78 bronchitis). In the report, we have retrieved data for the following diagnoses:

Ear infection: H01 ear pain, H71 acute middle ear infection, H72 serous inflammation

Respiratory symptoms: R01 to R29 (except R06 nosebleed)

Tonsillitis: R72 streptococcal tonsillitis and R76 acute tonsillitis

Colds: R74

Sinusitis: R75

Bronchitis: R78

The flu: R80

Pneumonia: R81

Other lower respiratory tract infections: R71, R82 and R83

Key figures

This report describes **XXX out-of-hours GP cooperative**

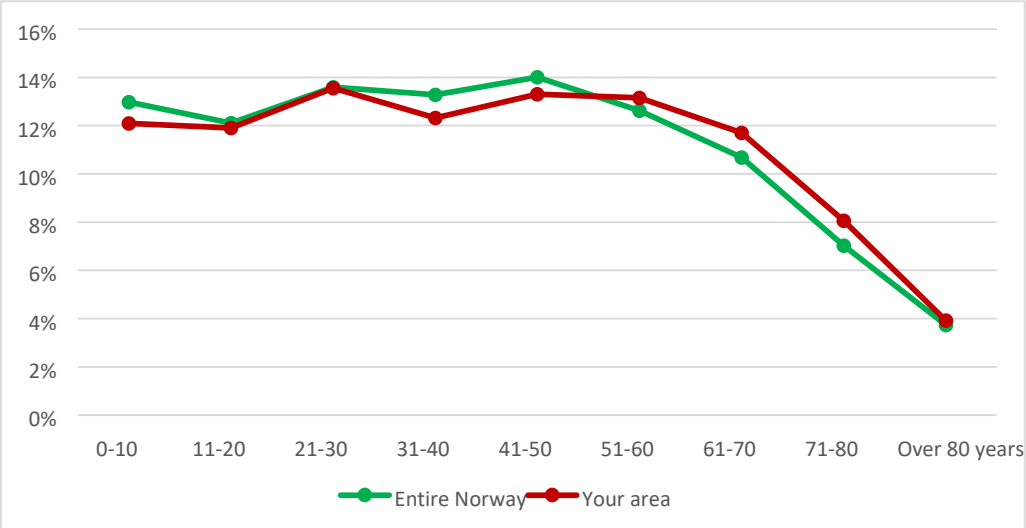
Number of inhabitants in the area: 83488

Number of inhabitants in Norway as of 1 January 2018: **5 328 212**

Your area includes 1.58% of the country's population.

1. Description of your area

There may be slightly different age distributions in different parts of the country. For example, if there are many children and adolescents in your area, this may result in a slightly different use of the out-of-hours GP cooperative. Here we show how the age distribution in your area compared to the whole country. The lines describe how many percent of the population is 0-10 years old, 11-20 years, etc.



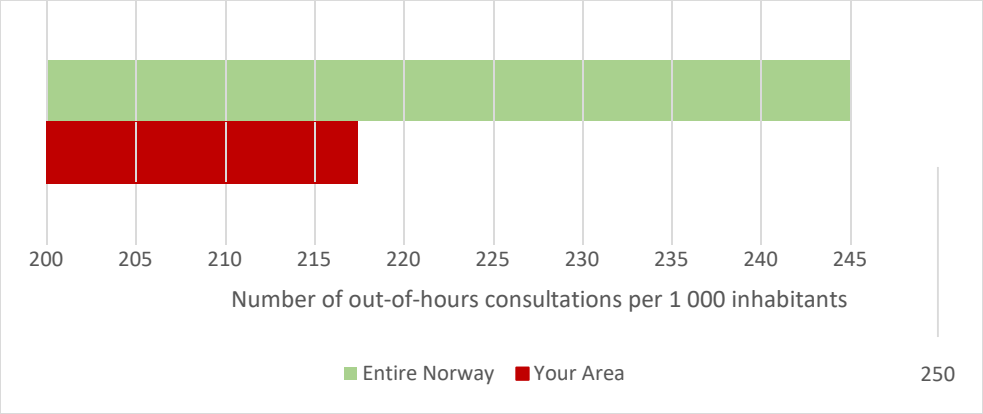
Discussion input:

Note the age distribution in your area compared to the rest of the country. How does it affect the working conditions in your out-of-hours GP cooperative?

2. Use of out-of-hours GP cooperative (all diagnoses)

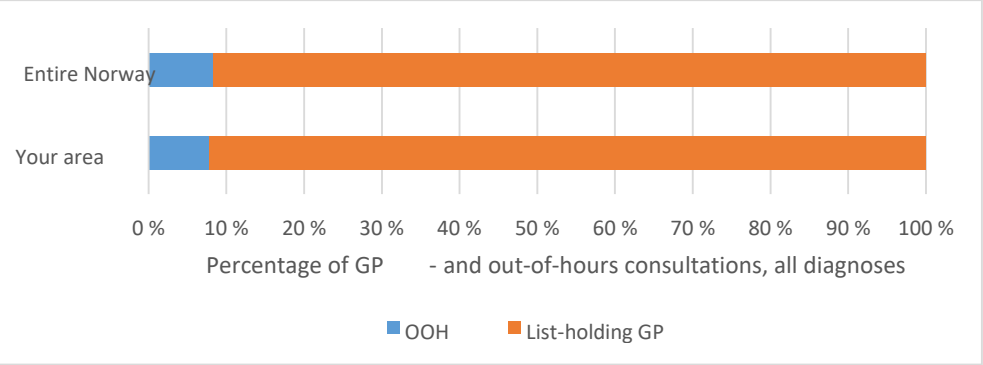
How the population uses out-of-hours GP cooperatives and list-holding GPs varies slightly from area to area. There can be many factors that contribute to such differences, such as stability in the GP service, geographical distance to the out-of-hours GP cooperative's location or established routines for cooperation between GPs and the out-of-hours service. In the figures below, we have only commented on the figures that apply to the whole country.

2.1 Total number of out-of-hours consultations per 1 000 inhabitants



The figure shows how many **out-of-hours** consultations and home visits per 1000 inhabitants there were in the period in your area compared to the rest of the country. In Norway, there were 245 out-of-hours consultations per 1,000 inhabitants, i.e., around 1 in 10 residents visited the out-of-hours service during the period.

2.2 Distribution of GP consultations and out-of-hours consultations all diagnoses



The figure shows the share of all GP consultations and home visits in either the out-of-hours service or list-holding GPs for all diagnoses.

Discussion input:

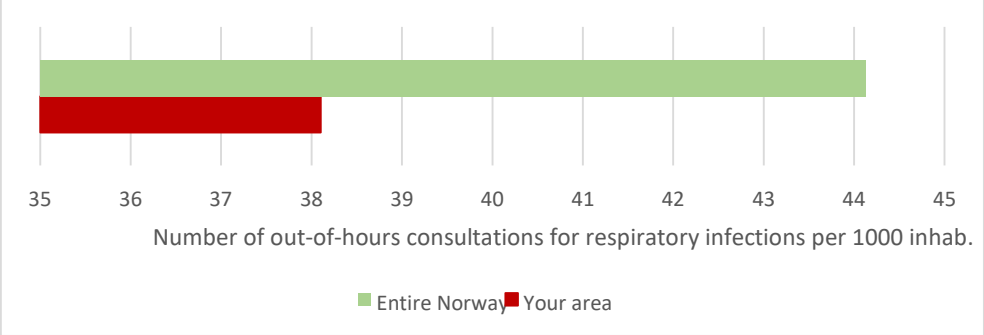
How is the collaboration between GPs and the out-of-hours service in your area?

How is the allocation of work between GPs and the out-of-hours service in their area?

3. Use of out-of-hours GP cooperative (respiratory tract infections)

Compared to other diagnoses, respiratory trat infections are twice as common in out-of-hours care as in GP practices. The reasons why respiratory tract infections are a typical out-of-hours problem, may be that they are acute conditions that occur rapidly, and that the ailments often worsen in the evening and in case of flat rent. In addition, many are concerned about a serious course of the disease. Nevertheless, there is some variation between different areas regarding how out-of-hours services and GPs are used for respiratory tract infections.

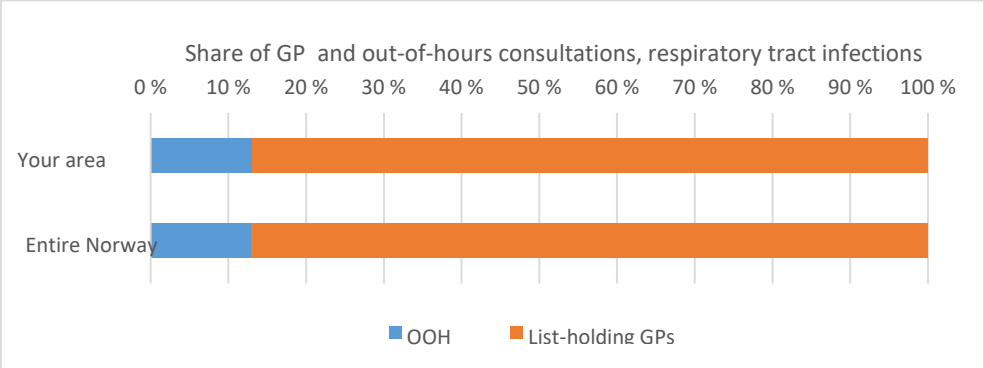
3.1 Number of out-of-hours consultations for respiratory tract infections per 1 000 inhabitants



The figure shows the number of doctor consultations and home visits with a diagnosis of respiratory tract infection in **the out-of-hours GP cooperative** in the period, per 1000 inhabitants, in your area and throughout Norway. In Norway, there were 44 such consultations per 1,000 inhabitants.

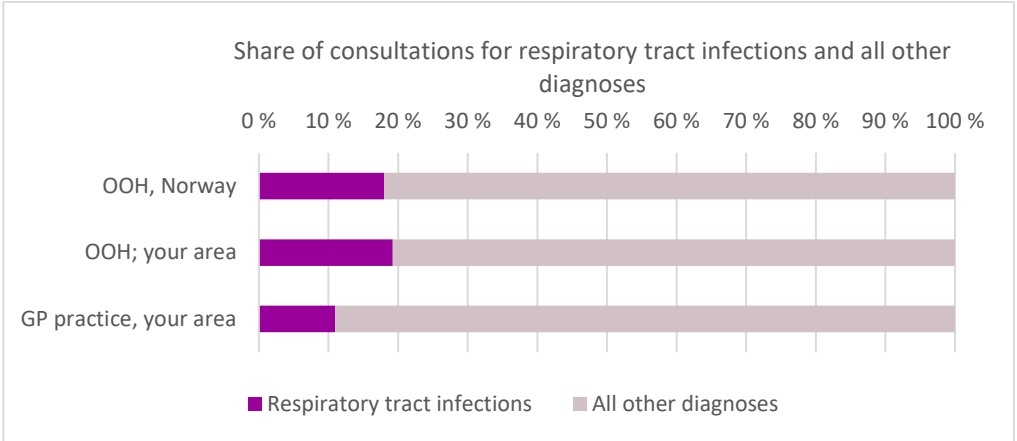
In your district, there were 38 out-of-hours consultations per 1,000 inhabitants.

3.2 Distribution of GP consultations and out-of-hours consultations for respiratory tract infections



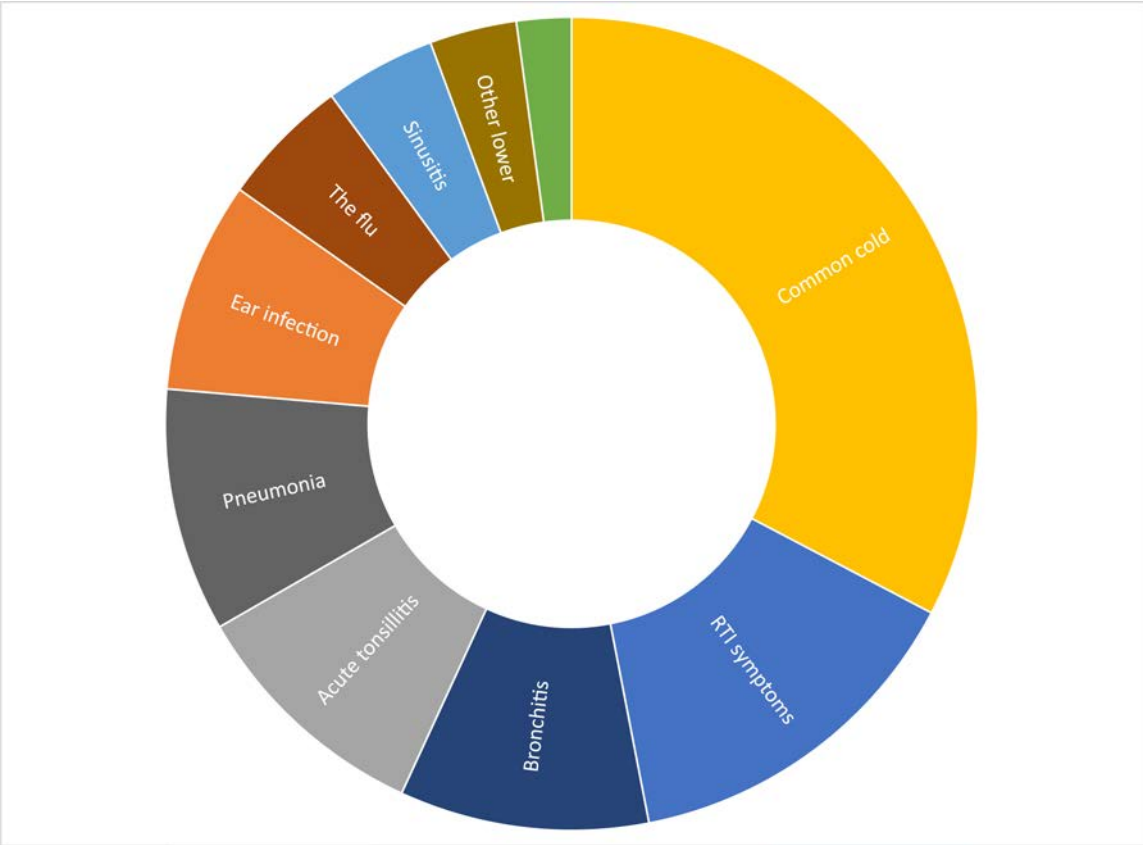
The figure shows the share of all respiratory tract infection consultations (including home visits) that take place in either the out-of-hours GP cooperative or with the list-holding GPs. In Norway, 14% of all these consultations take place out-of-hour, while 86% take place in GP practice. What's it like in your area?

3.3 Distribution of respiratory tract infection consultations and all other consultations in out-of-hours and GP practice



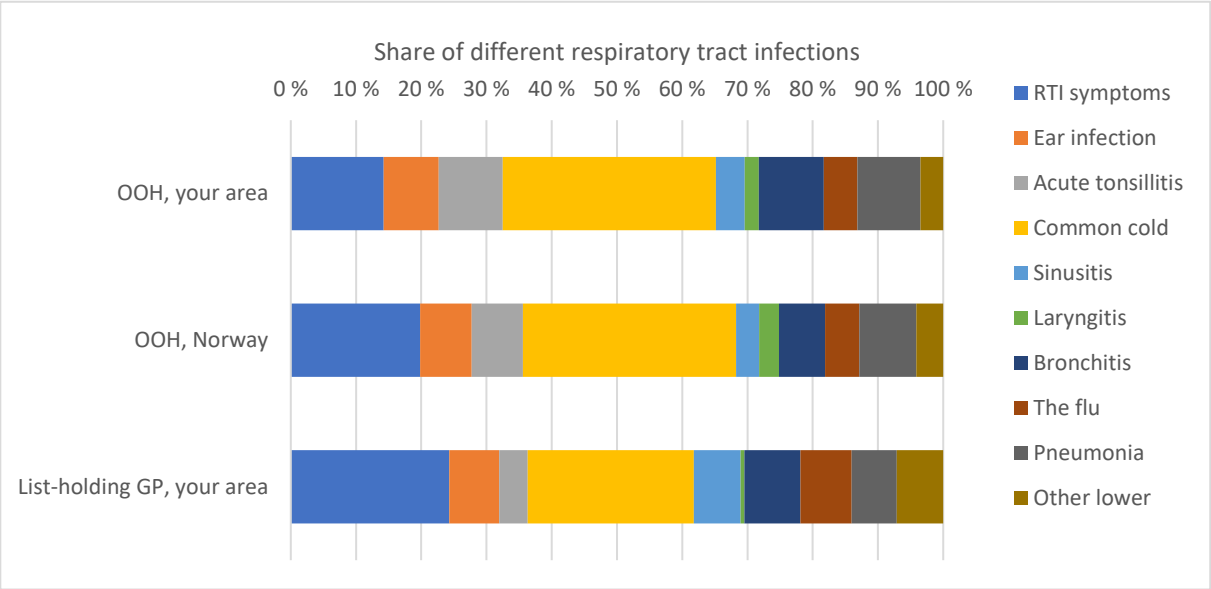
The figure shows how common respiratory infections are in the out-of-hours service and in GP practice. In all Norway, 18% of all out-of-hours consultations are due to respiratory infection. This means that around 1 in 6 patients in the out-of-hours service are due to respiratory tract infections. In GP practice, around 1 in 10 patients come due to respiratory tract infections. What's it like in your area?

3.4 Various respiratory tract infections, your area



The figure shows the proportion of the various respiratory tract infections diagnosed in a doctor's consultation at your out-of-hours GP cooperative during the period.

3.5 Various respiratory tract infections compared to GP practices and the whole country



The figure shows the proportion of the various respiratory tract infections diagnosed in doctor consultation and home visits in your area and throughout the country, for both out-of-hours services and GP practice during the period. The figures for your out-of-hours cooperative are the same as in Figure 3.4. In Norway, common cold and the collective group "Respiratory symptoms" are the most common diagnoses to be made in case of respiratory tract infections in the out-of-hours service. What's it like in your area?

Discussion input:

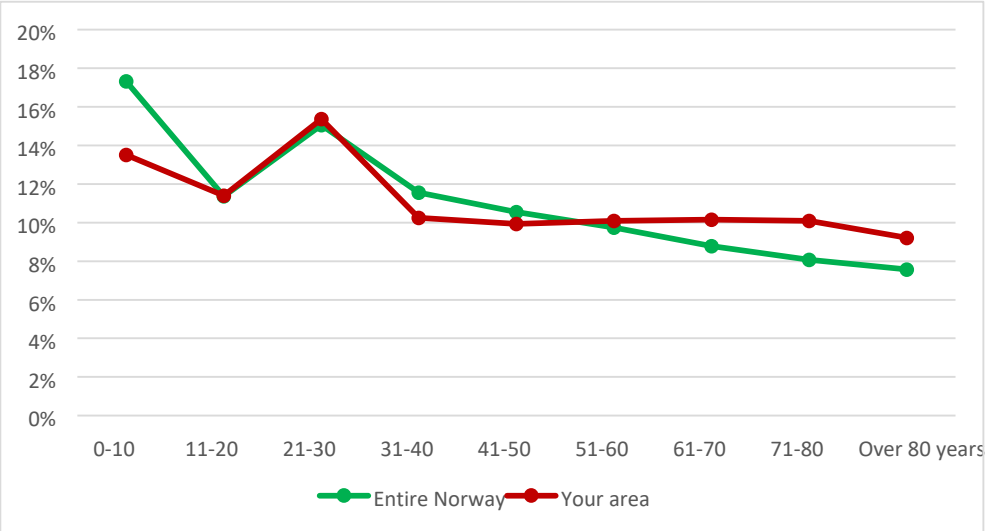
How does the population in your area use the out-of-hours GP cooperative for respiratory tract infections?

How does the distribution of diagnoses in your out-of-hours GP cooperative compared to the rest of the country? How do you experience the collaboration with GPs around this group of patients?

4. Age distribution

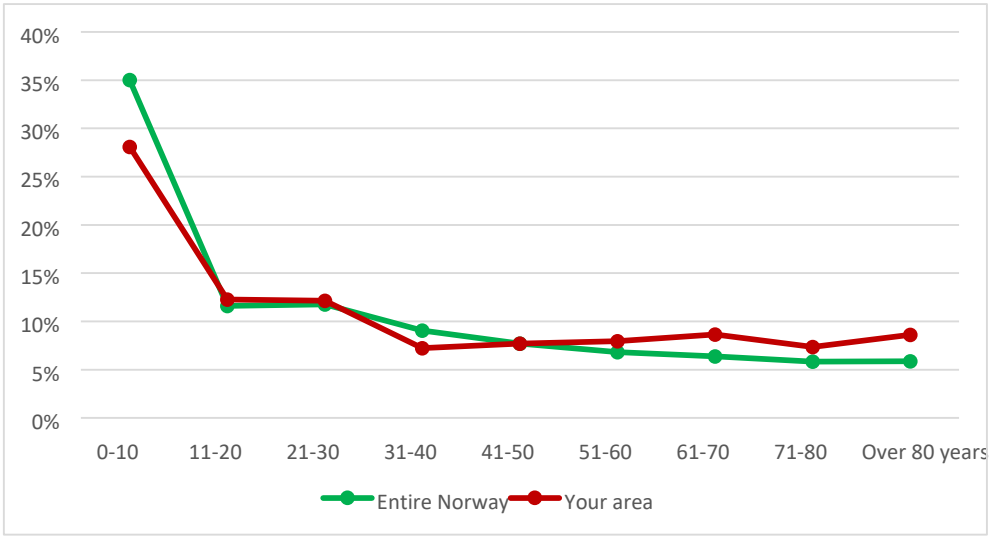
In this section, we will look at how different age groups use out-of-hours care and list-holding GPs. It may be useful to look at the figures in light of the figure in Chapter 1, which shows the age distribution in your area. Perhaps there are especially many young people in your area? Or especially a lot of old people?

4.1 All diagnoses out-of-hours GP cooperatives



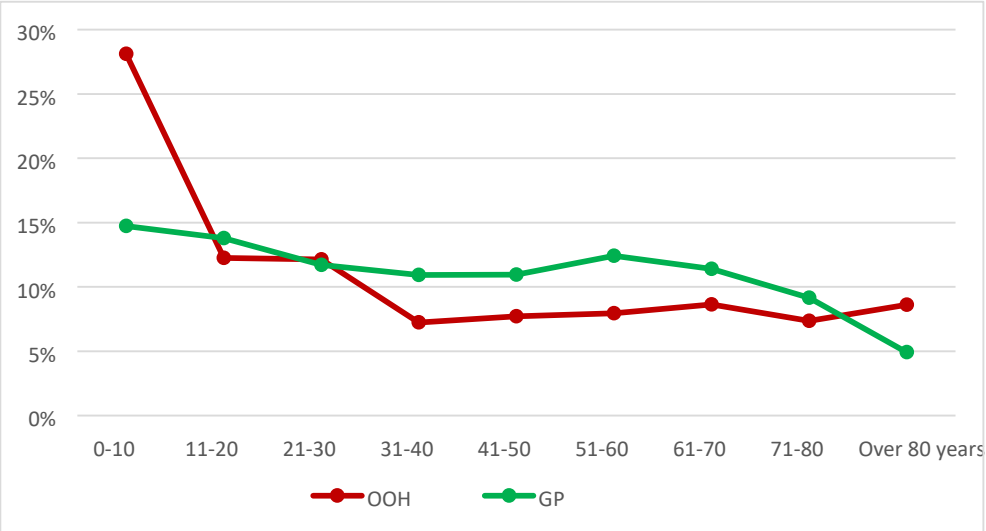
The figure shows the share of all out-of-hours consultations for each of the age groups in your district and in the country. Throughout Norway, the share of 0- to 10-year-olds is 17% of all consultations out-of-hour. What's it like in your area?

4.2 Respiratory tract infections in the out-of-hours service



The figure shows the share of respiratory tract infections consultations out-of-hours belonging to each age group in your district and in the country.

4.3 Respiratory tract infections in the out-of-hours service and GP practice in your area



The figure shows the share of all respiratory tract infection consultations for each of the age groups in your area. The out-of-hours line is the same as in Figure 4.2, but here out-of-hours service and GP practice are compared in your area. At your out-of-hours GP cooperative, the youngest age group accounts for around 28% of all respiratory consultations.

Discussion input:

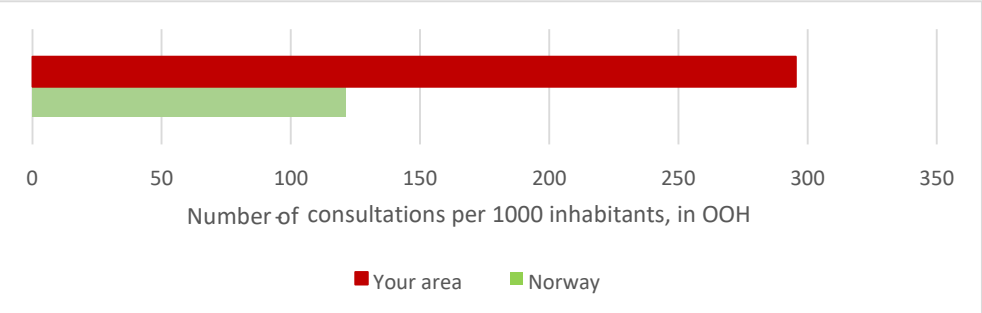
How would you describe the age distribution of your out-of-hours GP cooperative compared to the rest of the country?

How would you describe the age distribution of physician consultations for respiratory tract infections in your area compared to the out-of-hours service in the rest of the country? Or with GP practice in your area?

What do you think the cause of any difference could be?

5. Contact types

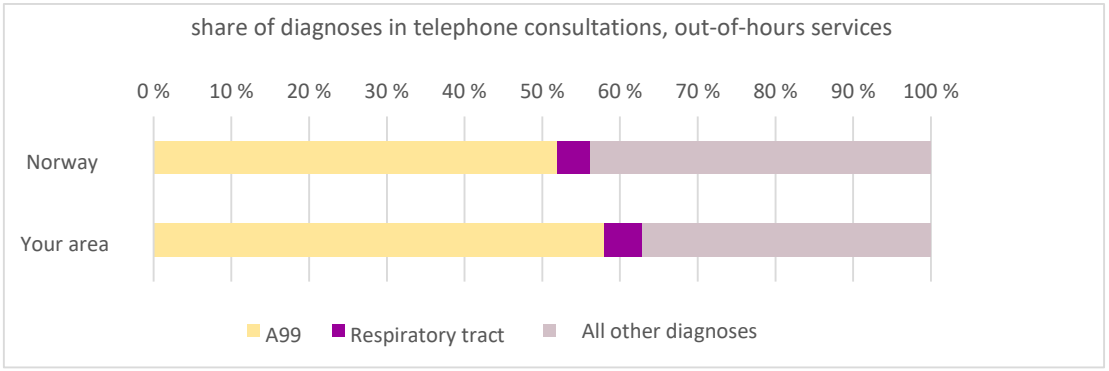
5.1 Number of telephone consultations in the out-of-hours service



The figure shows the number of telephone consultations per 1000 inhabitants for the whole country and your district. For the whole country, there were about 120 telephone consultations per 1,000 inhabitants. This means that 1 out of 8 people had telephone consultation with the out-of-hours service. How's your district?

5.2 Distribution of different diagnoses on telephone consultations

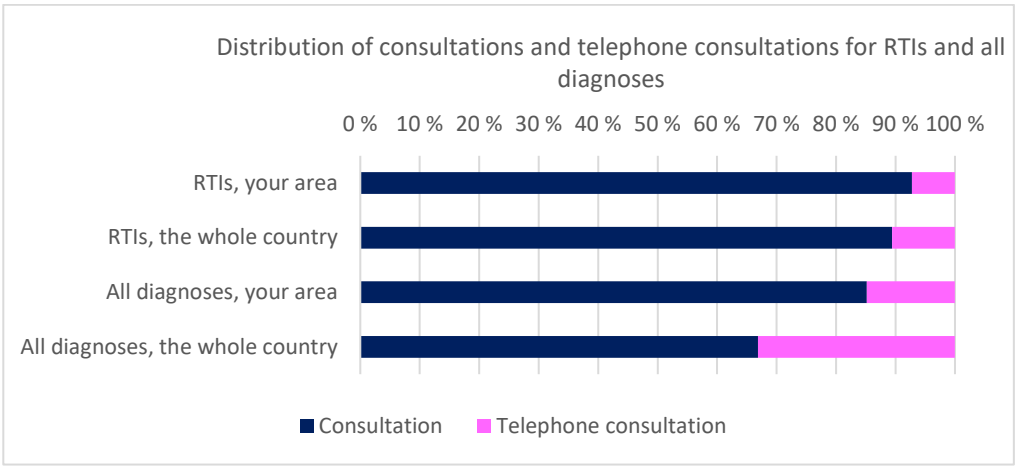
How telephone consultations are used varies widely between out-of-hours GP cooperatives. In Norway, 25% of all contacts to the out-of-hours service is handled by a nurse alone. It is the diagnoses that are made in these telephone consultations that form the basis for the figures in this chapter.



The figure shows what diagnoses patients receive when consulting in the out-of-hours GP cooperative. In Norway, the unspecific diagnosis of A99 ("Health Problem/Disease") is used in 52% of telephone consultations.

In your area, the diagnosis of A99 is used in 58% of telephone consultations.

5.3 Share of telephone consultations in total and for respiratory tract infections in the out-of-hours service



The figure shows the share of respiratory tract infections that are handled by telephone and during consultation/home visits in your area compared to the whole country. The figure also shows how this distribution is for all diagnoses for your area and for the whole country.

Discussion input:

How are telephone consultations used in your out-of-hours GP cooperative?

How is the diagnostic system used when the nurse give advice solely by phone in your area?

How do you assess the relationship between telephone consultation with a nurse and consultation with a doctor for the different diagnoses?

6. The way forward

The aim of this course has been for you as a nurse to gain more knowledge about respiratory tract infections, so that you feel safer when you assess callers with these infections. The intention is not to prevent all these callers from getting an appointment in the out-of-hours GP cooperative, but that you are more able to reach an agreement with the caller that a medical consultation is not always required for respiratory tract infections with mild to moderate symptoms. It has also been a goal that you should be even more confident of symptoms that indicate a serious course of respiratory tract infections, so that these can be identified and quickly get an appointment in the out-of-hours GP cooperative.

Input to discussion after completed e-learning course and group discussion:

What is your impression?

Do you want to implement changes? Which?

How do you want to implement these changes?

What measures will you take?

How can you measure the effect of the implemented change?

Appendix G (Translated from the original Norwegian version):

Respiratory tract infections in the out-of-hours GP cooperative

-Input for the completion of part two of the course

You are now in the process of completing part two of the course on respiratory infections. This part of the course is at least as important as part one (the e-learning course), and it is a great advantage if everyone has completed the e-learning course before part two is completed.

We hope that the report sent to you will help you have a good, professional conversation about your own out-of-hours GP cooperative. The intention is not for you as a group leader to be the expert in the discussion, but that you should facilitate good group dynamics and make sure that everyone makes oneself heard.

We recommend that you spend 2x45 minutes on the group conversation, but it can also work with 30 minutes if you don't have more time at your disposal.

We have created a PowerPoint presentation that you can use as an introduction to your team meeting if you have the time and if you want. There are notes for each slide. Your notes are important for reviewing your presentation. Where there are multiple points on the slide, your notes are organized so that the number on the slide has a corresponding number in your notes. We have created a separate pdf file where there is one page per slide, and where the notes belonging to the individual slide are below this. Feel free to run through your PP presentation a few times beforehand to get to know the animation and notes that come with it.

Here's our suggested program for the group meeting:

1. Show the PowerPoint presentation.
2. Quick talk in the group about the e-learning course (here you as the leader of the group discussion can choose what you want to talk about if you have limitedtime at your disposal)
    - What is the impression after completing the e-learning course?
    - What was new?
    - Is something unclear or is there something you disagree with?
    - Has the course provided new tools for communicating with callers?
    - Has anyone tried new communication tools after the course?
    - Anyone who wants to share their experiences with the group?
3. The report is handed out. It is important that you wait until you have finished your conversation about the e-learning course. There is input for discussion under each chapter. These are intended as a starting point. It is more important to have a good professional conversation about the use of the out-of-hours GP cooperative for respiratory infections than to get through all the points. At the same time, we recommend having plenty of time for Chapter 5, which deals with diagnoses set after telephone consultations.
4. Summarizing conversation about the way forward. Discussion input:
    - Should anything be changed at your out-of-hours GP cooperative?
    - If so, how should it be done?
    - Who takes responsibility for implementing any changes?
    - When and how should any new courses of action be evaluated?

If you have a short time at your disposal, we recommend that you only spend 2-3 minutes at point 1, and that the rest of the time is spent on points 3 and 4.

The aim of this course has been for out-of-hours nurses to gain more knowledge about respiratory tract infections and communication, so that they feel safer when they assess callers with respiratory tract symptoms. The intention is not to prevent all these callers from getting an appointment in the out-of-hours GP cooperative, but that the nurses are more able to reach agreement with the caller on courses of action other than out-of-hours consultations for mild to moderate respiratory tract infections. It has also been a goal that the nurses should be even more confident of symptoms that indicate a serious course of respiratory infection, so that these can be identified and quickly get an appointment in the out-of-hours GP cooperative.

Feel free to contact Bent Lindberg for questions, input, or views, both before, during and after the completion of the course.

E-post: b.h.lindberg@medisin.uio.no

Phone: 40220320

Good luck completing the course!

Sincerely,

Bent H. Lindberg	Ingrid K. Rebnord	Sigurd Høye
ASP/UiO	Norce/UiB	ASP/UiO

Antibiotikasenteret for primærmedisin (ASP)

NORCE
Nasjonalt kompetansesenter for legevaktmedisin (NKLM)

Errata

Page	Line	Footnote	Original text		Modified text
6	1		Respiratory tract infections (RTIs) are mainly low-urgent and self-limiting.		Respiratory tract infections (RTIs) are mainly self-limiting with low urgency.
7	12		They also need enough time to negotiate with the callers to reach a consensus when they judge that other measures than consultation out-of-hours is appropriate.		They also need enough time to negotiate with the callers to reach a consensus when they judge that other measures than consultation out-of-hours are appropriate.
18	7		Data from the sentinel network show that nurses coded 76 % of RTIs as low-urgent and only 0.02 as high-urgent (42).		Data from the sentinel network show that nurses coded 76 % of RTIs as low-urgency cases and only 0.02 as high-urgency cases (42).