



# FEELINGSTREAM

Converting customer conversations into success

Technical solution description

Track 3  
Data Provider



25<sup>th</sup> May 2021

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# 2026 -- EU Healthcare crisis

Problem

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**35%**

of doctors  
retired

**Only 30%**

of retiring doctors have  
replaced by graduates

**100 Million**

EU citizens will lose an  
adequate access to  
healthcare

# AI support and supervision

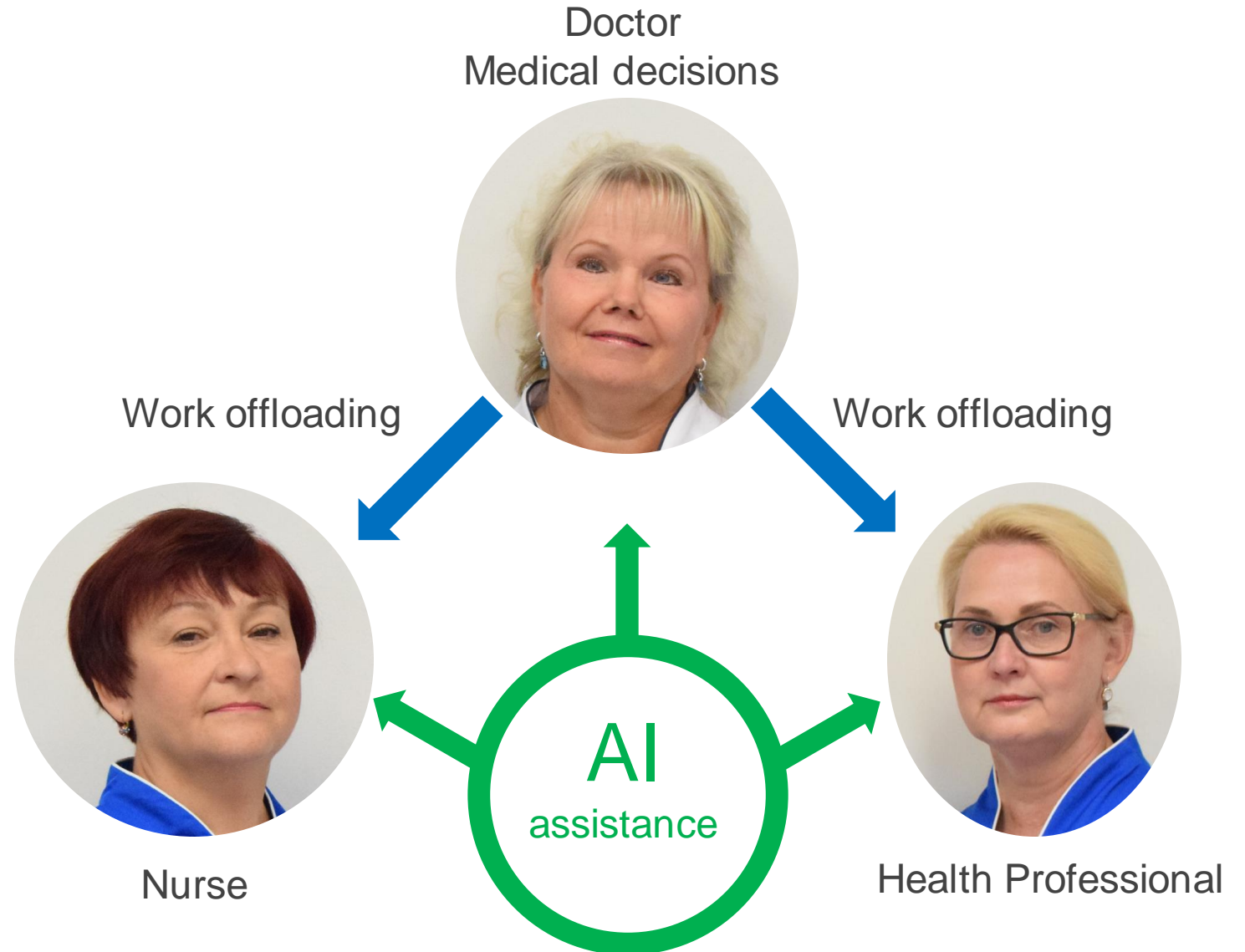
## Doctor's work will offload to the Nurses

### Family doctor's teamwork

We offload 30% of Doctors decisions to Nurses

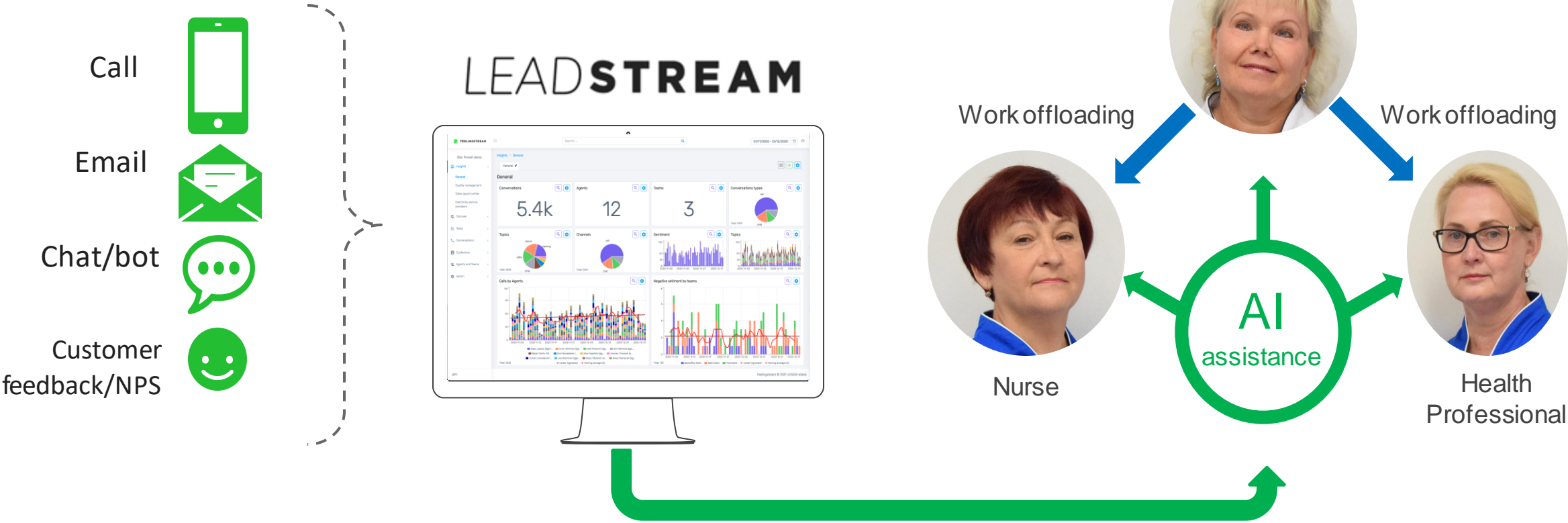
Provide the AI assistance to validate the cases Nurses can operate and validate the decisions

Provide visibility for doctors to validate Nurse's activities



# Feelingstream

## End-to-end platform for conversations insights



# Real-life experiment with Medicum



# Speech – to – text (ASR) in local languages

## Estonian language

00:43	Agent	Nii no teil on jah, praktoolokaga meil on ainult tasuline, 40 eurot maksab.
00:51	Customer	Et saatekiri nagu ei loe jah? Okei, ta nagu soovite. Metsikum, et Lasnamäel.
00:52	Agent	Ei.
00:59	Agent	No meil on doktori Josing ja aga ta võtab vastu ainult tasuliselt ja 40 eurot.
01:06	Customer	Okei, Lasnamäel võib kuskil mujal.
01:09	Agent	Ei, ta võtab meil siin punane 61, aga võib-olla kuskil veel ei oska öelda.
01:17	Customer	Aga millal muidu tema juurde saaks?
01:19	Agent	Nii kohe.
01:33	Agent	Homme, 14. Jaanuar üheksa 40.

## Russian language

Time	Speaker	Transcript
00:03	Agent	Оксана.
00:03	Customer	Здравствуйте, хотелось бы узнать информацию сегодня звонила днём медицинской сестре врача осьминог это ошибка, то в компьютере произошла по поводу больничного, она мне сделала с одиннадцатого, мне надо было с девятого она исправила, можете мне сказать, я лично.
00:05	Agent	Алло!
00:20	Agent	Я не знаю, то есть это ваш история болезни, только посмотрите залезть не могу, а вы сами да есть дочка, и я там можете посмотреть через видеокарту если.
00:24	Customer	Куда можно зайти!
00:28	Customer	Ясно хорошо, спасибо большое.
00:31	Agent	Пожалуйста, до свидания.

Site: Medicum

General

Topics



## General

## Conversations



48.5k

## Agents



14

## Words



6.57M

## Minutes of audio



1.2k

## Crosstalk share in %



9

## Topics



Total: 25935

## Channels



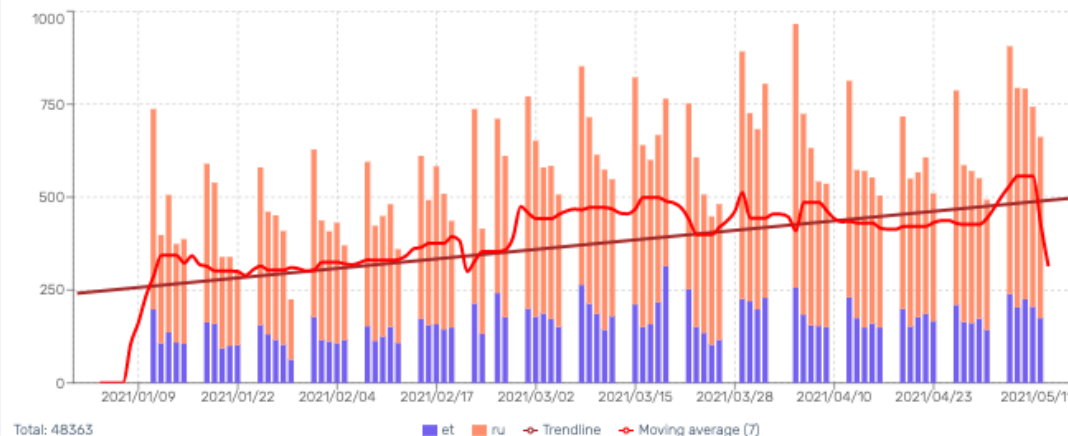
Total: 48486

## Language

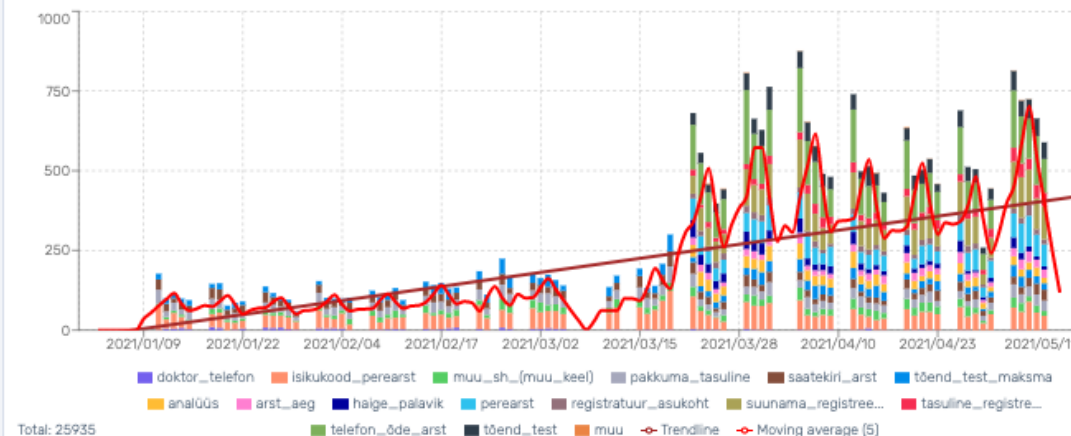


Total: 48363

## Calls by language



## Calls by topics



## Estonian vocabulary



## Russian vocabulary

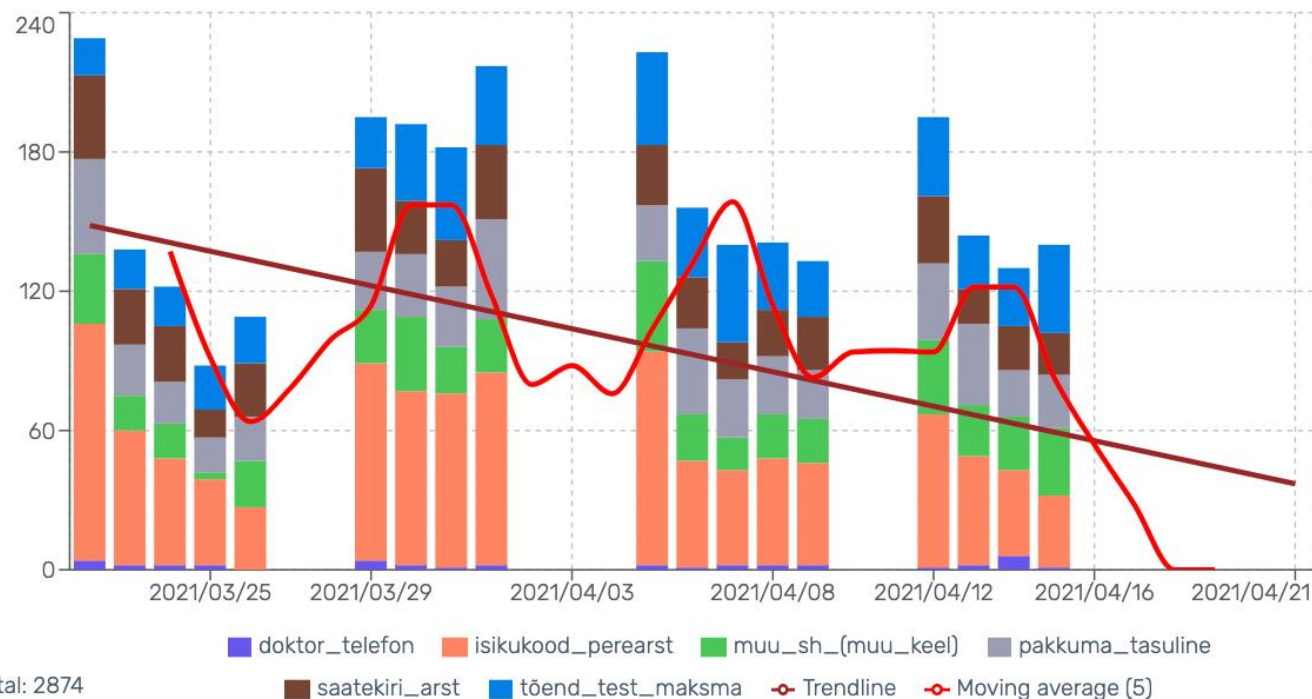


# Main reasons for calling – topic detection

Automatic classification

- 32% reserving time for Doctors visit
- 15% medical certificates issuance
- 14% reserving medical test
- 12% query to Special Doctor visits

Kõnede arv ajajoonel kõne teema järgi (vaid EST kõned)



Total: 2874



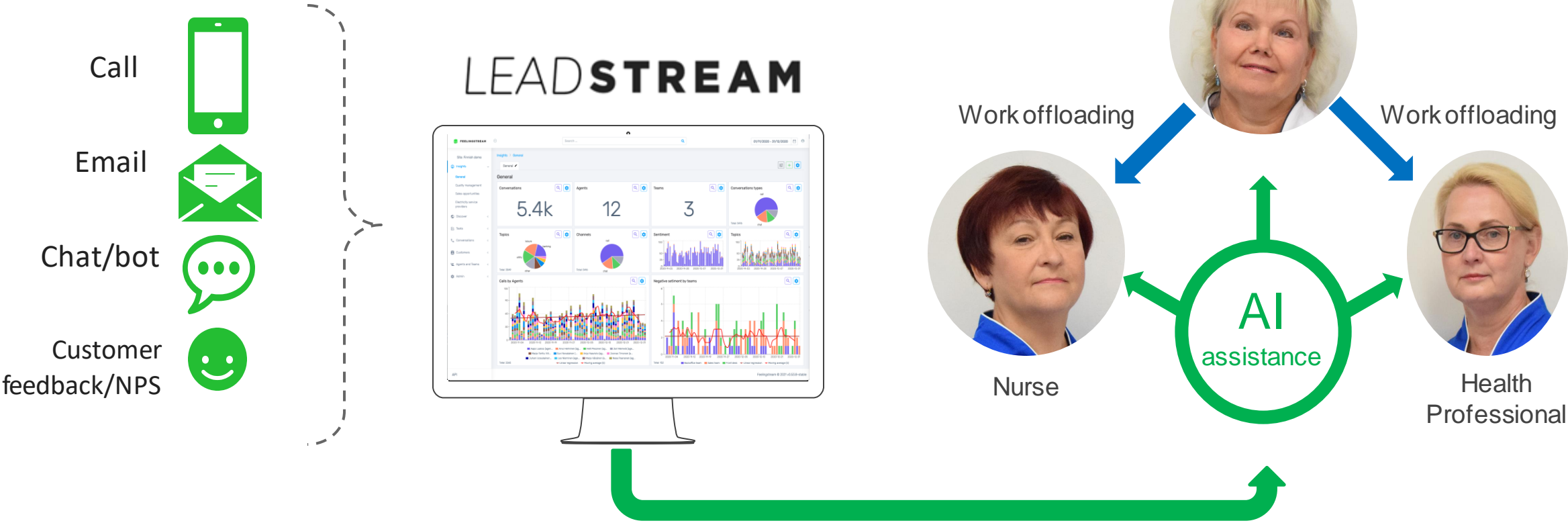
# Medicum Demo



# Solution description

# Feelingstream


## End-to-end platform for conversations insights



Summary		Info		Actors
Datetime	2021-04-03 00:00:00	Language	et <span>Change</span>	agent_12 as Agent
Channel	calls	Call type	incoming	customer_60 as Customer

Time	Speaker	Transcript
00:00	Agent	Koerast vuti võtan kübara mullina infot, siili fun Lepartamenta sarnast rahava onju. Leave spetsiini ja Vutsi vaps nuusumonia. Laworda piisavõltsa.
00:23	Agent	Olete kõne ootejärjekorras, palun oodake. Proosi ärida.
00:38	Agent	Ok.
00:42	Agent	Infotelefonil tere.
00:44	Customer	Tervist mandri selline küsimus, et mul ema hakkab jääma pensioniga kahe kuu pärast. Õelge, kuidas ta seda pensionit peaks. Kuidas sa, kas ta peab mingi avalduse tegema või kuidas teda saama hakkab?
00:56	Agent	Ikka ikka ikka jah, automaatselt nüüd ei hakata teda maksta, kui te muidugi mingeid pensioni liiki juba varem ei teadnud, ei saa. Et siis ta ikkagi jah, muidugi pensioni õigumi õiguse tekkimisest alates võite hiljem tulla kolme kuu jooksul dokumentidega või võib natukene parem tulla, aga pension määrata ikka selle õiguse tekkimise päevast alates.
01:04	Customer	Ei ei saa, ta käib tööil olles.
01:22	Customer	Aga kas ta peab, mis ta kaasa peab võtma?

### Evaluations



Nurse task score: 61.6

Area: stress, ärevus

Symptoms: ärevus, stress, unehäired mitmendat nädalat

Handled by: doctor

Epicrisis: mees u 40. aastane kurtis ärevust, ei ole saanud mitu nädalat korralikult magada. sundmõtted takistavad normaalset elu, suunatud psühholoogi vastuvõtule

Epicrisis translation: male about 40, has anxiety, cannot sleep. thoughts disturb life. Referred to psychologist visit

Action description: suunatud erialarsti juurde vastuvõtule

[Computed classification](#)

Conversation Transcript

Symptom's discovery

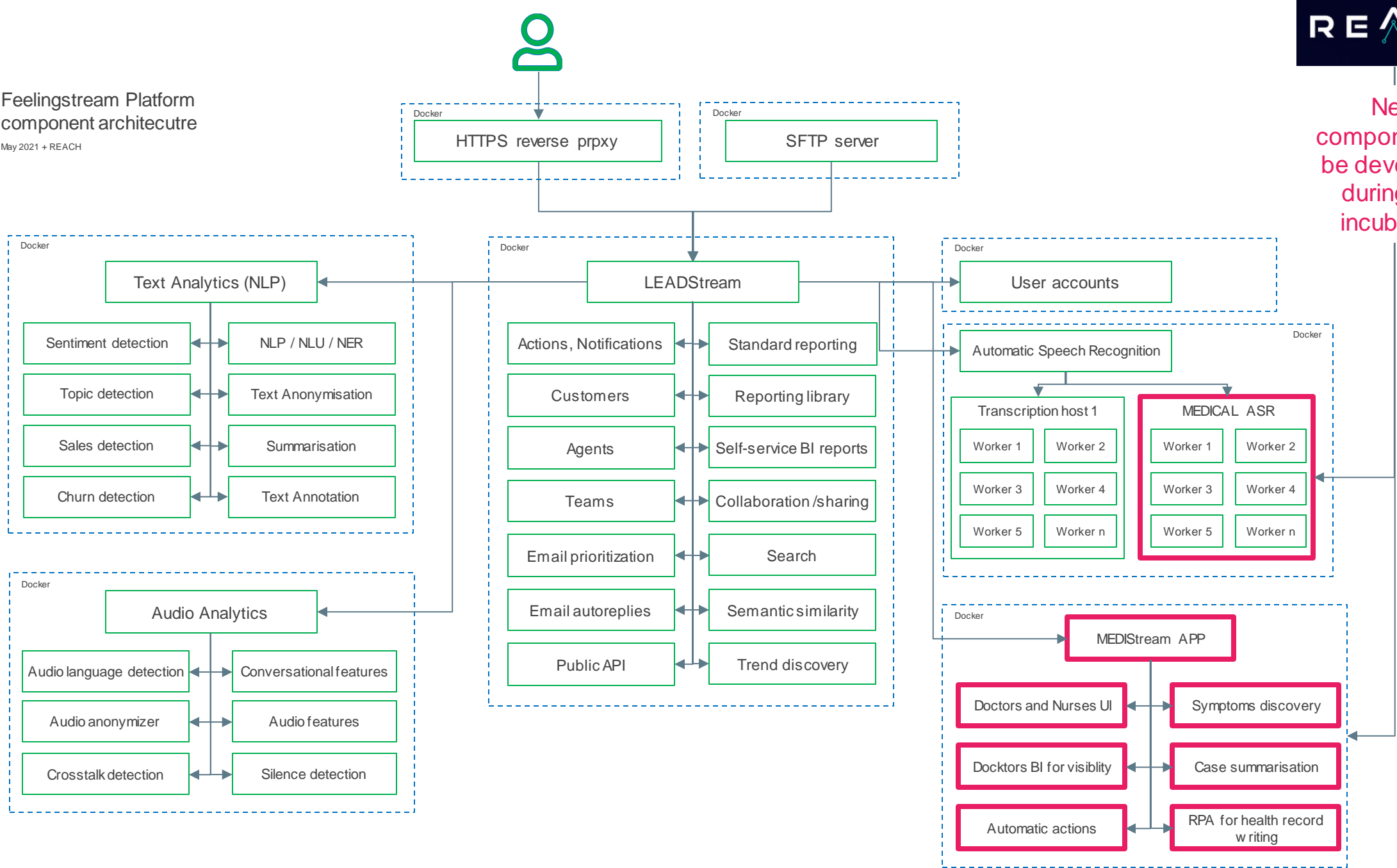
Epicrisis

Treatment verification

New components to be developed during the incubation

# Feelingstream Platform component architecture

May 2021 + REACH

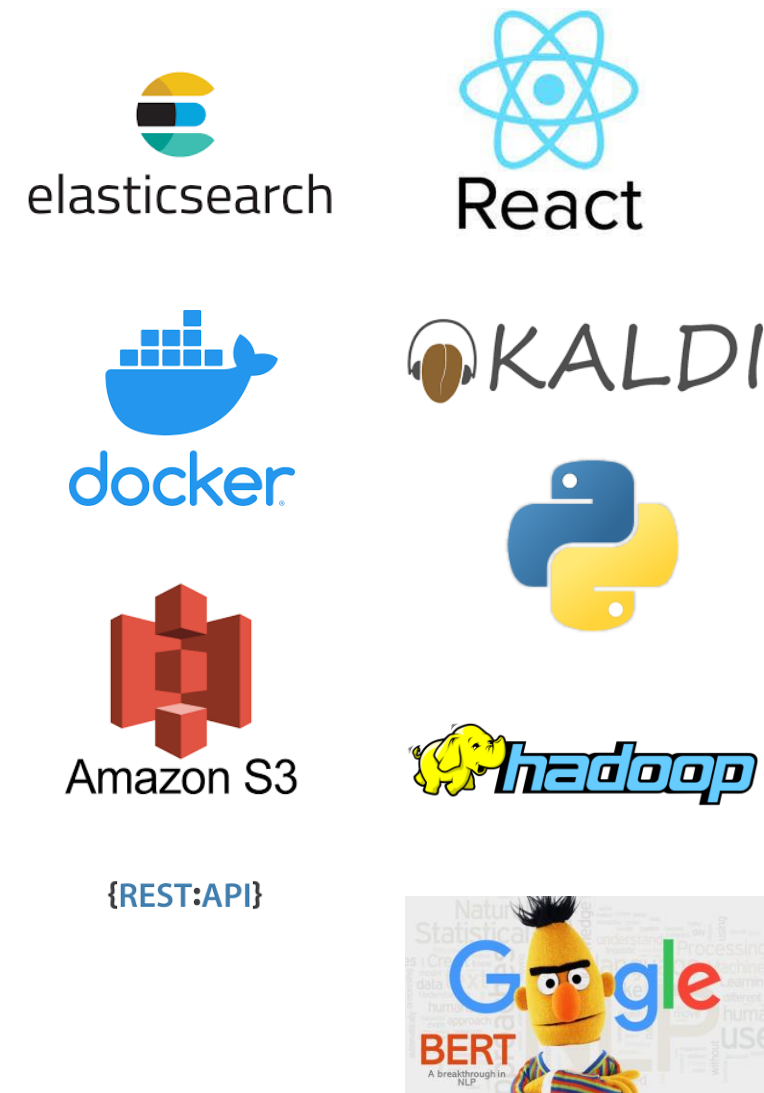


# Technological components used

- KALDI – ASR toolkit
- Elasticsearch – search and reporting engine
- Postgres – relational database storing the data
- NLP – Bert, Lemmatisation for Estonian and Russian languages
- REST API for integration
- React UI
- Audio storage – S3, Hadoop, local storage
- Solution is packaged to docker images

All customers databases are separate installations

No single component has data from several different companies

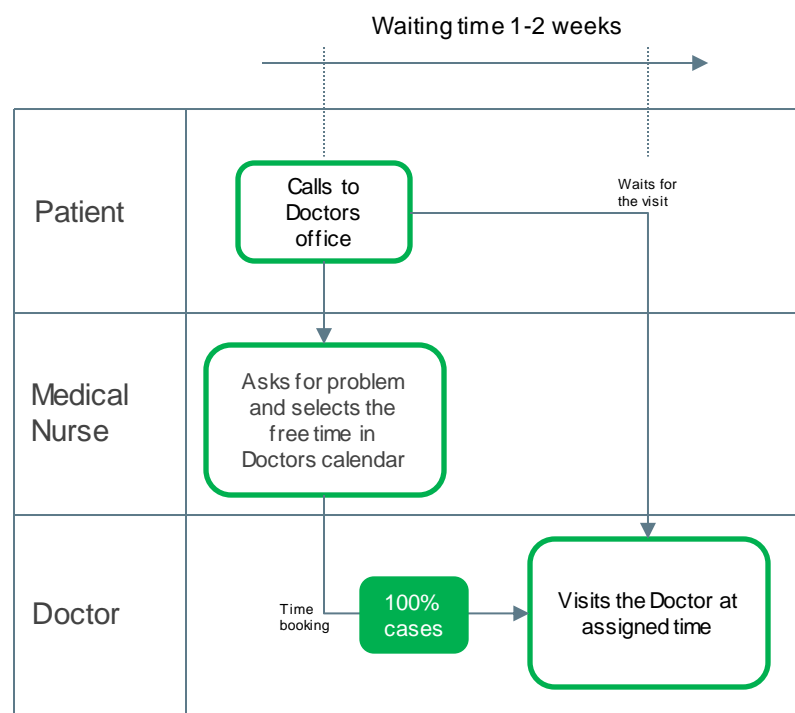




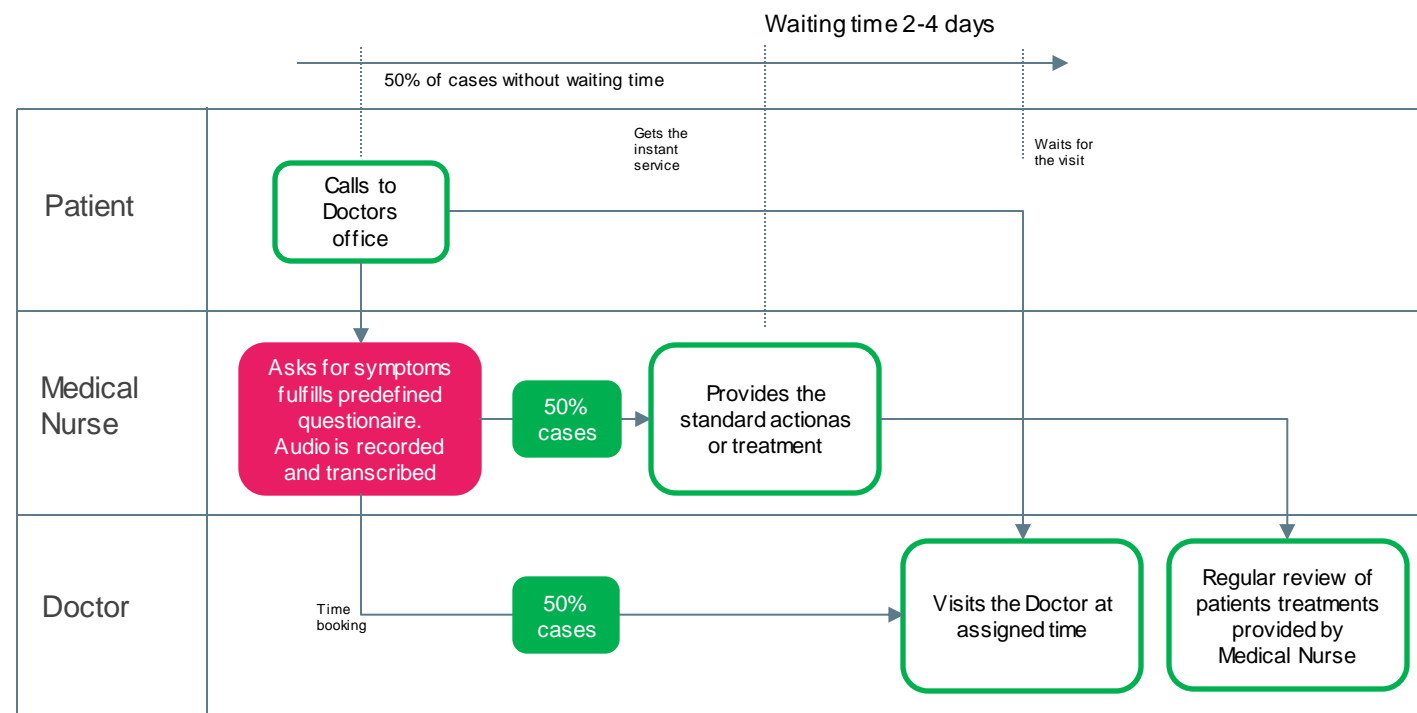
# Process improvement

50% of the cases are handled by Medical Nurses

## AS-IS process



## TO-BE process





**Prototype demo**

# ASR quality

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- General high quality
- WER 15% for spontaneous speech
- Easy to detect of the call topics
- Healthcare-specific words are mistranscribed

Conclusion:

ASR needs adaption to medical sector

## Estonian error examples:

- COVID: koovi (222), kohvid (91), kui viidi (14), korona\* (60), kovit\* (27), korono\* (4), kuveidi\* (101), kruviti (32)
- Gastroskoopia: Castro skoopia (10), Kasparov skoopia (6), kadro skoopi (6), cola skoopia (7), Astro skoop (9), troskoopia (2), Katroskoopia (4), horoskoop (3)
- Medicum: meedikum (589), meedium (8)
- Doktor: doctor (694)
- Pulmonoloog: pul monoloog (10), pool monoloog (3), pull monoloog (4)

## Russian error examples:

- Medicum: медикам (771)
- Корона (Corona): корана (587), карманные (32), макароны (126)
- личный код (ID code): отлично код (748)

# Medical symptoms discovery and summarisation

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- Medical symptoms can be extracted from the speech
  - Needs a separate model training
  - Initial list of symptoms should be agreed on or example labelling of data to be done
  - Different approaches could be used:
    - Keyword/-phrases detection
    - Classification
- Summarisation can be trained



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