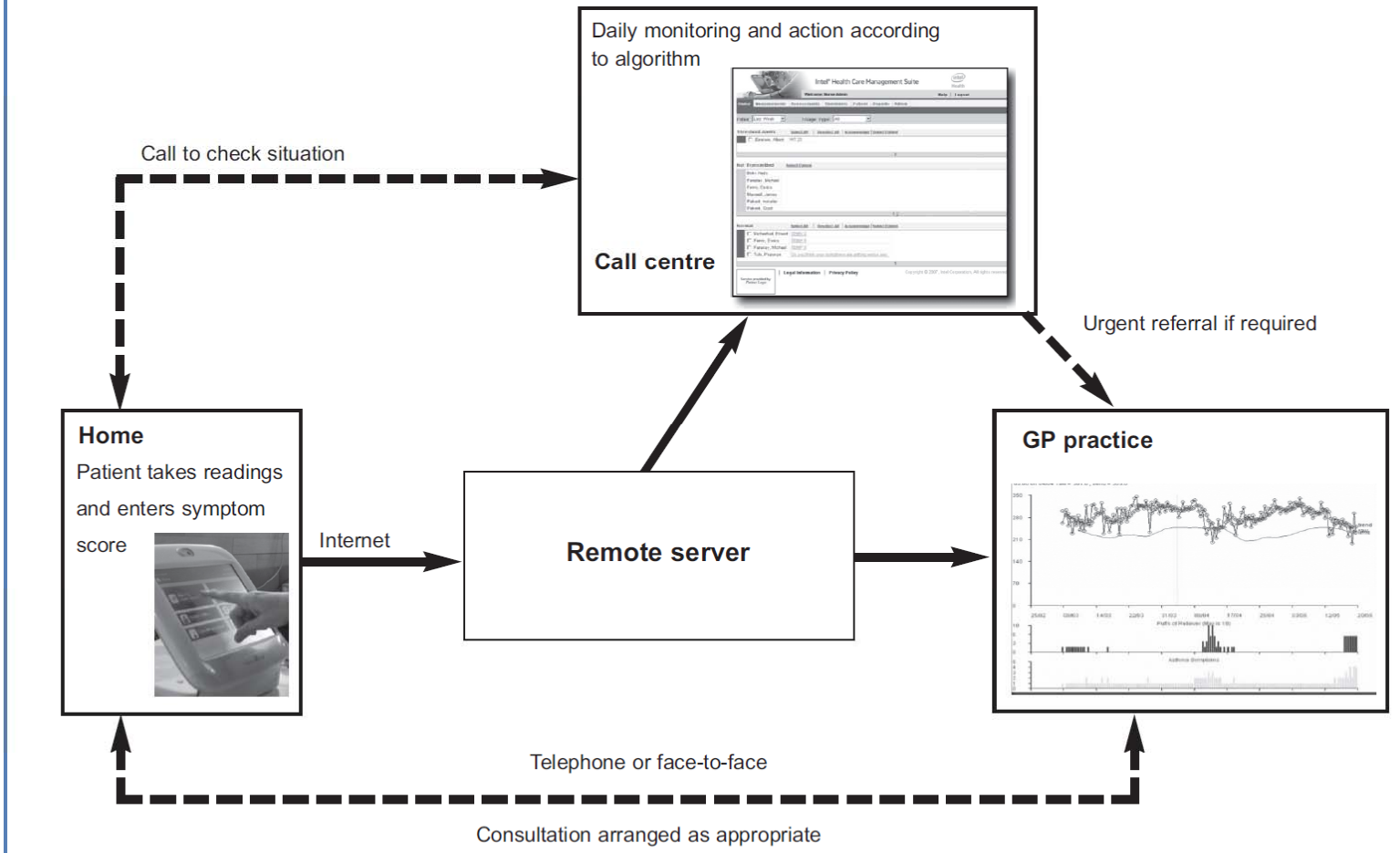
Human-machine Coexistence in Groups

George Kampis Paul Lukowicz Stuart Anderson
DFKI (German Research Institute for Artificial Intelligence), Kaiserslautern, Germany
Edinburgh University, Edinburgh, United Kingdom

“classical” telemonitoring

Figure 2. The COPD tele-monitoring system



Scoring scheme

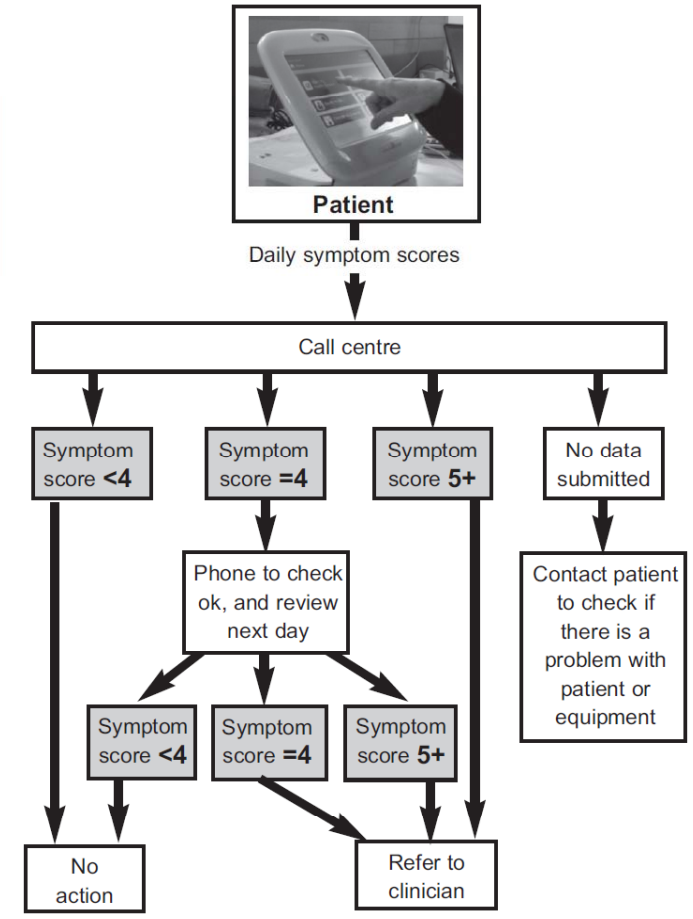
Table 1. The daily symptom questionnaire[16]

Each day, please record any WORSENING of symptoms from your usual daily level. The symptoms we are interested in are listed below, just tick yes or no in the box beside each symptom:

Symptom:	Yes	No
I am more breathless than usual*	☐	☐
My sputum has increased in colour*	☐	☐
My sputum has increased in amount*	☐	☐
I have a cold (such as runny or blocked nose)	☐	☐
I have increased wheeze or chest tightness	☐	☐
I have a sore throat	☐	☐
I have an increased cough	☐	☐
I have a fever	☐	☐

*These three core symptoms score two points. The other symptoms score 1 point.

Figure 3. NHS Lothian Telehealth Project Call Centre algorithm



The symptoms score refer to the daily questionnaire (see Table 1)

Results

- Patients like the system – primarily because it gave them privileged access to doctors...
- Doctors worried about:
  - High false positive rate
  - Over diagnosis
  - Over treatment
- *"In participants with a history of admission for exacerbations of COPD, Telemonitoring was not effective in postponing hospital admissions or reducing healthcare costs."*

- Scoring is de-personalised
- Contextual factors are excluded
- Difficult to prioritize patients
- Brittle response even at small scale

Diagnosis

- Capturing Context
  - Pervasive and mobile data capture
  - Formal monitoring activity
  - Open-ended
  - Social
  - Negotiation of key features
- Shifting Context
  - Individual
  - Global, systemic
  - Individualised

Diagnosis

- Cultures
  - Domestic: concerned, inexpert
  - Call Centre: risk averse, inexpert
  - General Practitioner: risk averse, expert, resource constrained
  - Acute Care: uninvolved
- Learning
  - More or less open loop
  - Easy to create “revolving door” cases.

“Social Sensemaking”

- Individual, family and carers “curate” the monitoring time series.
- Capture rich context – environment, patient condition, …
- Learning algorithm
  - Interactive, supports negotiation
  - Linking cultures supporting the transfer of context
  - Individualised
- Learning community
  - Horizontal links
  - Transferring experience

Settings

- Cultures
  - Long-lived
  - Value rich (empirical work)
  - Range of scale
  - Shifting and overlapping
- Context
  - Rich
  - Open ended
  - Unexpected
  - Capture is inherently hybrid
  - Sensors always miss things
  - Negotiated

Mechanisms

- Semantics
  - Tightly linked to culture/context
  - “Good enough” to understand now
  - Open-ended
  - Structured by cultures
- Mediation
  - Value systems differ
  - Boundary practices enable inter-working without agreement
  - Key element in crossing cultures

Mechanisms

- Incentives
  - Easy to get wrong
  - E.g. quality of care in the telemonitoring case
  - “Keeping people out of hospital” is probably better
  - Heterogeneous
  - Privacy harming?
- Hybridity
  - All computation is social
  - In particular the evolution process
  - Develop more participatory approaches to evolution.

Effects

- Learning
  - Opportunity to reflect
  - Incorporate reflection
  - Drives design and evolution
- Alignment
  - Temporary, requires repeated repair
  - Incentives encourage alignment
  - Linkage between values and incentives

Conclusions

- Focus on Hybridity and Diversity
- Hybridity drives the programming model…
- Diversity drives the data model…