

Quality Assurance in Healthcare with R

Titus Laska, Dirk Schumacher, Michael Höhle

Federal Institute for Quality Assurance and Transparency in Healthcare, Germany
Unit for Medical Biometry and Statistics

erum2018 lightning talk

Budapest, Hungary, 16 May 2018



The IQTIG

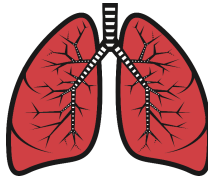
- Central institution for the quality assurance in the German public healthcare system



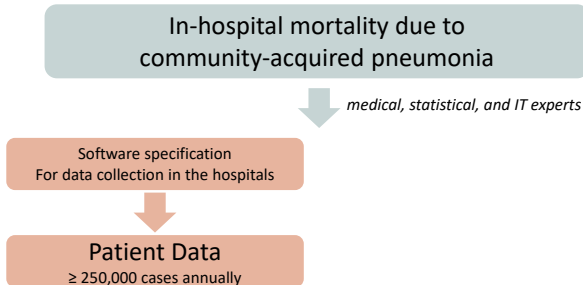
- Founded in 2015

What we do - an example

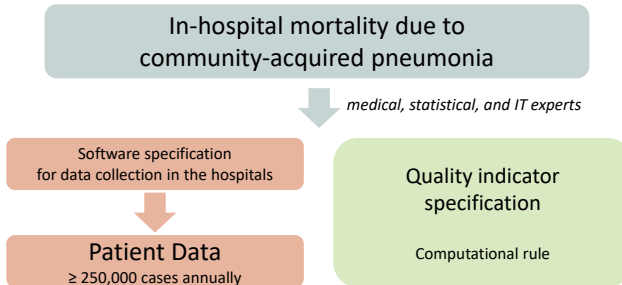
In-hospital mortality due to
community-acquired pneumonia



What we do - an example

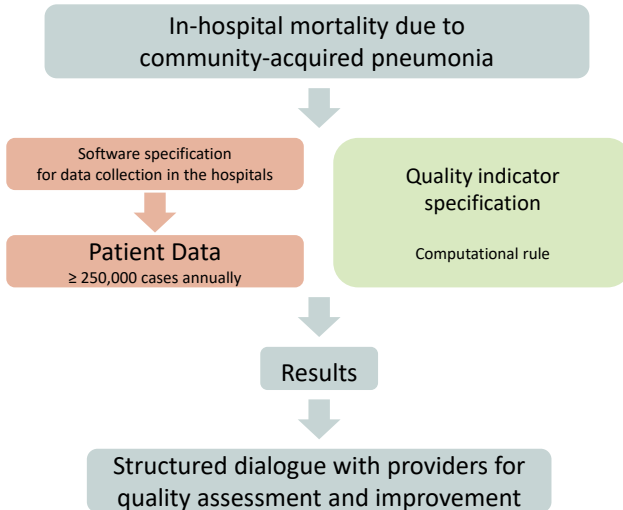


What we do - an example



Software specification and computational rules are publicly available on our website

What we do - an example



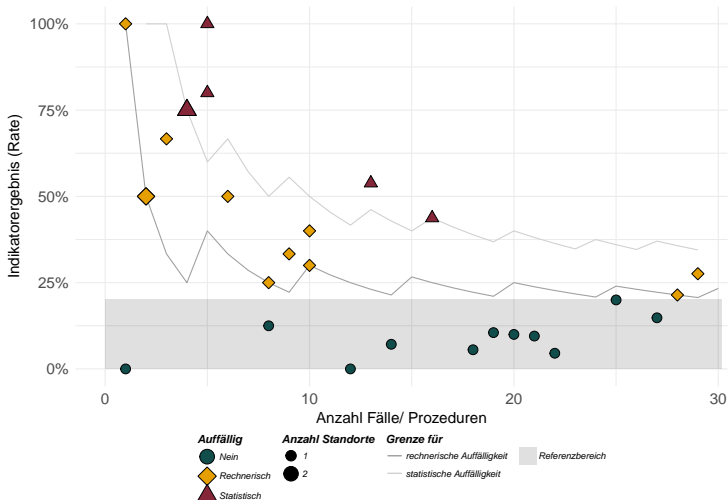
How we use R

At the Medical Biometry and Statistics Unit, we use R

- for ad hoc analysis of data
- for the development of new statistical methodologies
- for internal reporting tools (e.g. shiny)
- in production: packages for automatic computation of results
 - e.g. 21 million numbers for our standard routine report

How we use R

Funnelplots

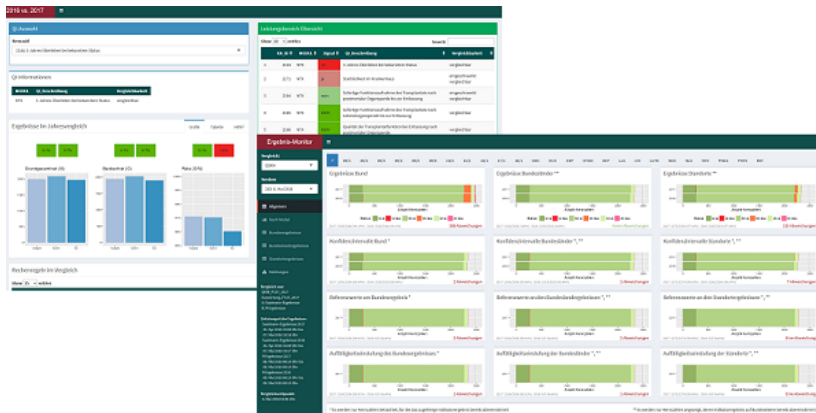


Internal infrastructure

- Statistical analysis is a team effort!
- Code review and automatic tests
- Independent proof-calculation of results
- Aim: Maintain high quality of analyses and published results

Internal infrastructure

- Internal package repository (~10 actively used packages)
- Shiny server:



External transparency

Computation rules for our ~280 quality indicators

- Definition of the relevant sets from the data
- Specification on how to count
- Will be published as R code

External transparency

- Mostly simple Boolean expressions in base R:

```
age >= 18 & blood_pressure >= 140
```

- Special abstractions to make code more compact:

```
diagnosis_code %isAnyLike% ICD$ICD_Infection
```

```
all(postoperative_infect == 0) %group_by% patient_id
```

External transparency

R package IQTIGpvci

- We recently published our first R package: IQTIGpvci
- Reference implementation illustrating methodologies for performing hospital classification in the context of uncertainty

External transparency

R package IQTIGpvc

■ Available on our website:

Downloads (R-Paket)



IQTIG – R functions for hospital profiling

2018 / 09.04.2018 / PDF / 143 KB



IQTIG – R functions for hospital profiling (Package "IQTIGpvc")

2018 / 09.04.2018 / GZ / 60 KB



IQTIG – R functions for hospital profiling (Package "IQTIGpvc" description)

2018 / 09.04.2018 / HTML / 78 KB

<https://iqtig.org/das-iqtig/grundlagen/biometrische-methoden/>

■ Licensed under GPL Version 3

External transparency

Ermittlung statistischer Auffälligkeit

Statistischer Test	Einseitiger exakter Binomialtest basierend auf mid-p-Werten
Signifikanzniveau	$\alpha = 5 \%$
Pseudocode	<code>compute_rate_pvalue(o, n, t, alternative = "greater", midp = TRUE) \leq 0,05</code>

Example of R code (using IQTIGpvc) published in a juristic document (plan. QI directive, G-BA 2016)

https://www.g-ba.de/downloads/62-492-1368/plan-QI-RL_2016-12-15_iK_2017-03-24.pdf

Summing up

- R supports us in our mission to improve healthcare quality in Germany
- R enables us to be more transparent, because it's open source