Supplementary material

Effect of clinical peer review on mortality in patients ventilated >24h: cluster-randomized controlled trial

Table of contents

Schmitt J, *et al. BMJ Qual Saf* 2022;0:1–9. doi: 10.1136/bmjqs-2021-013864

Description of IQM clinical peer review process

IQM is an association aiming to improve inpatient care in member hospitals. IQM membership is voluntary without any regulatory requirements. Participation in clinical peer review (PR) is compulsory for all IQM member hospitals. In addition to participating in clinical PR, members are required to provide and publish accounting data for assessment and comparison of patient outcomes between member hospitals.

The IQM clinical PR is highly standardized. A steering group is responsible for supervision and continuous development of the IQM clinical PR and for development of indicators ("tracers"), which are used to trigger a clinical PR.

The clinical PR has three stages, each including different steps:

1. Preparation (case selection, self-assessment, and clinical PR analysis of selected cases)
2. Implementation (external, on-site assessment, dialogue between reviewers and hospital staff, discussion and approval of sustainable and achievable measures)
3. Follow-Up (report, action plan)

1. Preparation: Preparation includes the selection of IQM member hospitals for clinical PR based on a tracer, an analysis of the selected (patient) cases and a self-assessment by the hospitals chosen for clinical PR.

The IMPRESS study aimed to analyze the effectiveness of clinical PR regarding mortality in patients with ventilation>24h (tracer). Therefore, clinical PRs were initiated in hospitals with mortality rates above average in this tracer. All these tracers are predefined in the continuously updated German Inpatient Quality Indicator (G-IQI) Set. The mortality of patients ventilated >24h is defined as indicator 56.1 G-IQI (1).

After selection of member hospitals for clinical PR, IQM forms a clinical PR team including physicians and nurses with different positions and qualifications to analyze the indication covered by clinical PR. With respect to ventilation >24h, the clinical PR team includes physicians and nurses specialized in e.g. anesthesiology, pneumology or emergency care. To become a professional peer, it is obligate to become certified. Certification as a professional peer requires educational courses based on a structured curriculum of the German Medical Association and training sessions in two clinical PRs. The hospital chosen for clinical PR compiles a case list. After selection of cases, an assessment by the peers and self-assessment by the hospitals follows in advance of the external on-site assessment.

2. Implementation: After the preparatory (self-)assessment of the cases, the preparation of necessary case files, and access to the hospital information system, the clinical PR team conducts an on-site assessment. After analyzing patient data for systematic improvement potentials, these potentials are discussed with staff responsible for patient care. As mentioned above, this especially includes physicians from different disciplines and nurses. At the end of the clinical PR, responsible hospital staff and clinical PR team define achievable and sustainable measures, as required for the peer review report. The main challenge of this report is to define clear and precisely formulated potentials for improvement to derive an action plan. The visited hospital is responsible for both this action plan and its implementation.

3: Follow-Up: A report with the consented measures is sent to the participating hospital and IQM. All potentials of improvement are summarized for the management of the hospital to inform and to foster implementation of measures for improvement. The hospital departments involved in the clinical PR

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receive a report including all relevant issues revealed during clinical PR to define an action plan for improvement.

The protocols evaluate the following criteria based on a scoring system:

- adequate and prompt diagnostics as well as treatment
- prompt and targeted examination of treatment process
- adequate and prompt indication
- guideline adherence
- control of the course of treatment
- conflict-free interdisciplinary and interprofessional cooperation
- coherent and complete documentation

Based on these criteria, potentials for improvement and proposals for measures are derived and protocolled in consent between reviewers and hospital staff. Formal criteria such as the completeness of the examined medical records, readability, access, or personnel representation in the peer review are assessed. IQM summarizes reports and evaluates different aspects like satisfaction of the hospitals/departments, process parameters, and main potentials for improvement.

Especially main potentials for improvement are discussed by the steering group and prepared for further presentation to reviewers and members hospitals.

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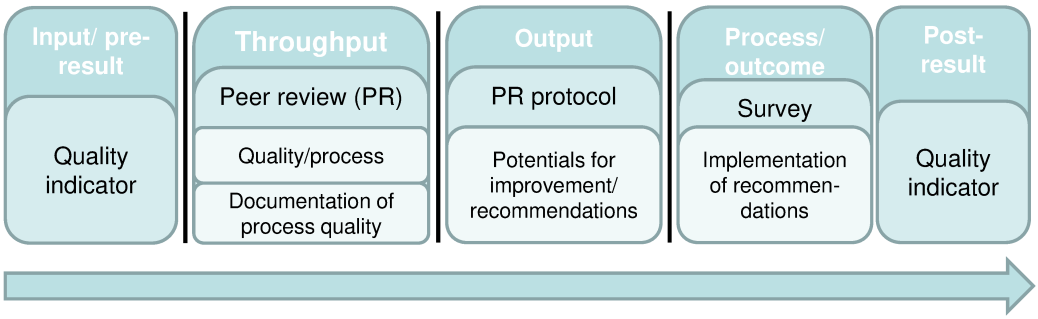

Figure S1 Throughput model of Peer Review

Table S1 Definition of patient population and subgroups

Group	**Indication**	**Main definition / ICD-10-GM codes / OPS codes**	**Further inclusion/exclusion criteria**
Total population	Ventilation > 24h	Ventilation for more than 24 hours	Age > 27 days
Subgroup: Patients ventilated > 24h with…	Myocardial infarction	Main diagnosis: I21 or I22	Age > 19 years
	Stroke	Main diagnosis: I60, I61, I63, or I64	Age > 19 years
	COPD	Main diagnosis: J44	Age > 19 years, no tumor (C00 – C97, D00 – D09)
	Pneumonia	Main diagnosis: A48.1, J10.0, J11.0, or J12 – J18	Age > 19 years, no tumor (C00 – C97, D00 – D09), no mucoviscidosis (E84, U69.00), no transfer from other hospital
	Colorectal resection	OPS codes: 5-455, 5-456, 5-484, 5-485	-

Table S2 Number of included hospitals and cases by subgroup analysis

Study group	Control group						Intervention group					
Study period	Pre-Intervention			Post-Intervention			Pre-Intervention			Post-Intervention		
Subgroup	Hospitals	Patients	SMR	Hospitals	Patients	SMR	Hospitals	Patients	SMR	Hospitals	Patients	SMR
Myocardial infarction	22	291	1.42	5	275	1.41	19	330	1.27	7	276	1.29
Stroke	18	571	1.43	6	552	1.32	18	413	1.41	6	372	1.27
COPD	25	400	0.79	4	392	0.83	26	466	0.71	4	489	0.77
Pneumonia	27	499	1.11	2	488	1.00	25	441	1.06	4	521	1.02
Colorectal resection	17	63	1.42	8	70	1.04	20	81	0.93	8	62	0.97

Table S3 Contents of implemented measures

Content of measure	n	%
Additional equipment	1	1,2
Additional intensive care capacities	2	2,5
Additional software	5	6,2
Additional staff	1	1,2
Administration	1	1,2
Briefing	1	1,2
Case review	1	1,2
Combined approach	7	8,6
additional staff, director documentation, additional software care strategy, inter-professional care qualification, communication, information provision qualification, director, care strategy qualification, documentation qualification, care strategy		
Documentation	26	32,1
Inter-professional care	6	7,4
Care strategy	16	19,8
Organizational structure	1	1,2
Qualification	2	2,5
Updated/ additional SOPs	11	13,6
Sum of implemented measures	81	

References

1. Mansky T, Nimptsch U, Cools A, Hellerhoff F. G-IQI German Inpatient Quality Indicators Version 5.0 [Internet]. 2016. Available from: www.seqmgw.tu-berlin.de/fileadmin/fg241/GIQI_V50_Band_1.pdf