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## Review Article

# Comparing Technical Quality Assessment Methods for Measuring Quality of Healthcare: Systematic Review

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## Abstract

**Purpose:** The present study aimed to compare advantages and disadvantages of Technical Quality (TQ) assessment methods in healthcare.

**Methods:** A systematic review of five electronic databases; PubMed, Cochrane, Ovid, SID and Medlib, was performed without any time restriction. Search strategy included the following combination of keywords: "guideline adherence", "adherence to standard", "adherence to protocol", "technical quality", "clinical quality" and "quality measurement". Articles that were either quantitative or qualitative on technical quality assessment methods were eligible to be included in the study.

**Results:** Out of the 39 included articles, 13 different TQ measurement methods, were described and categorized into eight main groups. Consumer's reported quality data were the most frequently cited method followed by paper medical record, electronic health record, composite measure and chart review. Each method for measuring and assessing TQ of health care had its cons and pros and in choosing a method for quality measurement these features need to be considered. In this section, the most important features of each method were described.

**Conclusion:** The use of each quality assessment method depends on the aim of assessment & its result application; study design for quality assessment; study field of quality assessment and available resources such as money and time for quality assessment.

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## Introduction

Quality in healthcare defined from different perspectives and also different methods used to measure quality of healthcare. One of the comprehensive definitions of quality is doing the right thing, at the right time, in the right way, in the right place for the right patient with the right outcome. Quality in health care has three dimensions: technical quality (TQ), Service Quality and Customer Quality [1]. Technical quality refers to the clinical or disease specific aspects of care and deals with what the customers receive relative to what is known to be effective, and largely reflects issues related to the health care providers [2]. TQ differs from condition to condition and shows how well health systems deal with the specific condition. TQ also, has two main dimensions: the appropriateness of the services provided and service provider's skill [3].

Donabedian proposed a useful systems-based framework of structure, process and outcome to measure quality of health care; according to this framework, structure refer to input and service delivery environment, process expresses actual care

delivery and content of care and finally outcome represent interaction between customer and a health care [4].

Measuring quality and performance of healthcare provider is an important factor for purchasers and quality improvement efforts to increase physicians' responsibility, accountability and improving quality of delivered care. On the other hand there are many models to measure TQ in health care and each has some advantages and disadvantages. Therefore, selected model to measure TQ should provide valid, reliable, inexpensive, applicable and effective to study purpose.

According to TQ poor quality could be occurred in three forms: overuse, i.e., and provided more than standard, Underuse, i.e. not provided according standards and misused provided inappropriate care [5]. On the other hand, process of care can be categorized to three conditions; preventive care, curative care of acute illness and care for chronic disorders. More ever, quality of health care should be assessed from the viewpoints of major stakeholders such as service user, provider' and health administrators. Shifting concept of quality measurement and

health systems improvement from input based, inspection and quality control perception to a valid and systematic measurement of quality and continuous quality improvement require appropriate, valid and implementable methods. The aim of this study is comparing technical quality assessment methods advantage and disadvantage in healthcare.

**Methods**

**Data sources and search strategy**

We performed a systematic search of three English and two Persian electronic databases: Pub Med, Cochrane and Ovid for English and SID and Medlib in Persian, without time limitation. The following keywords were used: "guideline adherence", "adherence to standard", "adherence to protocol", "technical quality", "clinical quality" and " quality measurement".

**Article selection**

Our eligible criteria for selecting articles were either quantitative or qualitative studies about technical quality assessment methods. Only studies published in English and Persian were included. Articles that refer to technical quality assessment method, measuring clinical quality included in this study. Articles about report TQ result, assessing other dimension of quality or did not discussing about TQ measurement methods, Article that refer to guideline adherence effect in researches and guideline implementation without quality measurement, were excluded.

At the first stage all articles were screened based on their titles and abstracts. Retained articles were then reviewed in depth. After that, references eligible to the above criteria were identified by hand searching of related journals and references of selected article and finding 7 additional empirical articles were added to the review [6].

**Analyses**

Content analysis was used to abstraction any text mentioning implementation advantages or disadvantages of TQ measurement methods from the selected articles, and for this purpose we made up an extraction table include bibliographical information, TQ assessment method, application filed and advantages and disadvantages of methods. Then, final table that contain methods and sub methods features and application filed of each methods. Content analysis of transcripts was done by authors to code and crumble main categories to expanding themes after consultation. The data were determined for the purpose of the study and the categories are derived from the data in content analysis.

**Results**

**Table 1.** Frequency of references to each method.

Row	TQ measurement method	Sub method	No	Row	TQ measurement method	Sub method	No
A	Medical record	Electronic health record	6	D	Observation	Video techniques	1
		Paper Medical record	9			Direct observation	3
		Electronic quality monitoring	2	E	Vignettes (written case simulations)		1
B	claims-based data	composite measure	6	F	Standardized Patients		2
		prescription claims	1	G	Healthcare providers		4
C	Administrative data	chart review	6	H	consumers' reported quality data		10
		discharge data	4				

**Observation**

Systematic review resulted in 1762 original articles and reviews. Initial screening of titles and abstracts resulted in 132 articles for full text screening, and 7 additional records identified through other sources and reference of references. Finally, we included 39 papers in total (see Figure 1 for the search flow).

The 39 included articles identified 13 different TQ measurement methods, which categorized in 8 main groups. Consumers' reported quality data were the most frequently cited methods and after that is paper medical record, electronic health record, composite measure and chart review (Table 1).

Each method for measuring and assessing TQ of health care have some pros and cons, which need to be considered doing quality measurement, the most important features of each method were described in Table 2.

**Medical record**

According to the study findings, medical record because was documented [7-9] is more flexible to use[10, 11], and can be able to convert to Electronic Data Capture (EDC) [12], can be conducted formative or summative [12] and was able to use as an functional method [13], electronic medical record simplest documentation and abstraction [12], But this method have some barrier and limitations such as: errors in abstraction or transcription [14], incomplete record [8, 9, 14-16], unstructured free text [12], uncertainty about validity and reliability and lack of information on patients' actual medication [9, 14].

**Consumers' reported quality data**

Customers are one of the most important sources for quality assessment data. So that he/she as a "co-producers" reporting most valuable and unique data [16-18]; furthermore, costumer reported data is less expensive, amenable to large surveys independent of the practitioner and practice setting [16, 18- 21], this data reflect educational feedback and can be used as an output assessment [22]. So many articles recommended Consumer reported data to measure chronic and long term conditions such as Type 2 diabetes. On the other hand, recall bias [16, 23] and Patients' inability to report specific results [17,24] is the most important weakness of this method.

**Administrative data**

Administrative data is one of the most important sources for quality measurement, According to the related articles this data is able to continuously monitor performance [17], less expensive [18], Includes both claim and encounter data [19] and simple to access to use for quality improvement activities [17,19]. In contrast, this data is not completely accurate andrecording bias [20-22] is a weakness of such data, due to not clinically detailed in some cases does not provide useful information [20, 22, 23].

Observation is one of the most frequently used methods for measuring TQ, by collecting first hand data can be used as

stimulus and best practices developing and training [24], on the other hand, Extract both qualitative and quantitative data [24] and if provider were adequately masked could be a gold standard [20]. Patient consent, Medico legal, confidentiality [24] and training valid observer to assessing quality [24] is costly and time consuming way [25], also, validity and reliability of this method is under question [24].

**Vignettes (written case simulations)**

A vignette is a written exam was used to assessing knowledge of health care provider about scientific issues. This method is a low cost way to measure TQ [20]. Instead, focus only on provider knowledge regardless of them skill, actual performance, could result in inconsistency [20], overestimation and consequently limited to use these method in outpatient setting [20].

**Healthcare providers**

Self assessment and use of providers reported data for TQ measurement have some pros and cons; one of the most positive important advantages of this sort of data is its agreement with customer reported data on the actual situation [26], on the other hand, underestimation and overestimation of quality according to the personality characteristic [15] and bias in self-assessment of healthcare providers reported data are the weakness of this method [15, 16].

**Standardized Patients**

Standardized patient (SPs) is a trained person to act as a teal patient, which can be used as a gold standard for TQ measurement [20]. Also, SPs measurement is highly accurate, valid, reliable [20, 25] and can be measures TQ for Cross system comparison purpose [20], whereas high cost [20, 25], Intrusion into a physician's practice [20] is its weakness and detection of patient, attention only to verbal communication [20, 25] and incur the opportunity cost of time the physician [20] and finally applicable to only outpatient setting [25].

**Claim-based data**

Claim data is a perfect method to the large-scale studies [13, 23, 42], more ever, performances of health care provider and systems were displayed as indicator-based and case-based adherence [42, 43], considered continuum of care and quality assessment result can be used for benchmarking best practice [23]. In contrast, quality reports in this measurement method were significantly biased, and overstate performance [13]. This kind of TQ data is a secondary data [42], might be, so incomplete and less robust for quality measurement purpose [21]. Also, it is not valid, reliable and clinically detailed and because of lots of missing data in the claim databases [21].

**Discussion**

Quality assessment and data collection methods and sources have important role in quality improvement initiatives. In this study 8 main and 13 sub category methods were identified to assess TQ of health care. According findings each method has some pros and cons and can be used with considering these features. Customer and healthcare provider reported data are the most and main source for quality assessment purpose and other data sources use these data to generating new sources. Although, measuring agreement between different data sources is one of the ways to check and approve accuracy and reliability of data sources.

Although some methods have high accuracy and validity, they could be costly, time consuming, limited applications and cost effectiveness of this method to improve quality and use of the information for this purpose is so low. Observation and SP provide valid and exact data but was implementing have some problem and application field is limited. However, customer

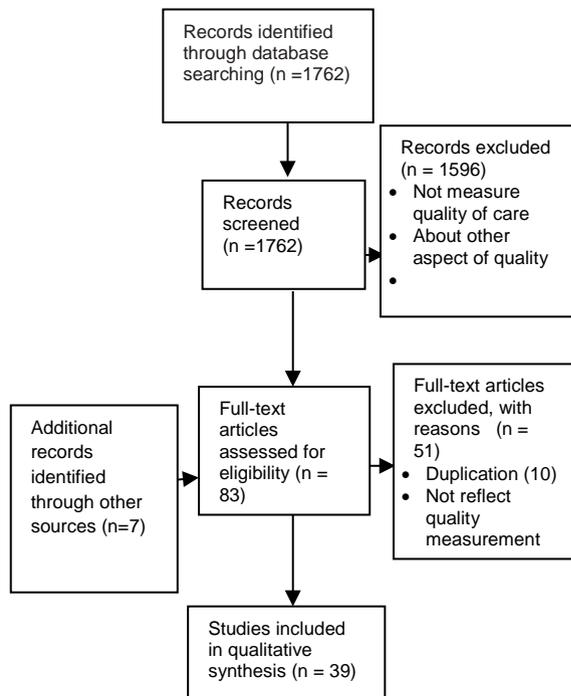
reported data also is valid and also was applicable and inexpensive to collection. According to Dresser and colleges study cervical cancer screenings from administrative data were very close to those obtained from chart reviews, whereas the rates for pediatric immunization and prenatal care differed greatly. Also patient rated TQ of care and knowledge of health care provider can be affected according many factors such as technical and interpersonal features [46]. Chart review is one of the traditional methods and some studies emphasize reliability and the use of supplementary data sources of that before use of it must be indicate validity and utility chart review [47]. At the other hand, in some studies medical records have been identified as a suitable source to use in judging the appropriateness of that use [48]. But, like patient questionnaire its validity related to the service type. For example, medical record and patient reported data is high specific method for most services, but, patient reported data were sensitive than medical record for almost every services [49].

At the other hand, use of each method can be some positive and negative side effect on other factor such as; customer reported data must be use to patient involvement and education [50], use of providers' data involving them in quality improvement process and encourage health care provider to investigate poor quality and planning to improves this problem.

**Conclusion**

The use of each method depends on: the aim of quality assessment and its result application, study design for quality assessment, study field of quality assessment and available resources such as money and time for quality assessment. Although accuracy of quality measures is under question, but this effort have positive effect on performance, patient care and can be used to studying effectiveness of treatments [13].

Figure 1. Article selection diagram.



**Limitations of the study:** This review concerns TQ assessment methods advantages and disadvantages in general, which mentioned poorly within databases and no specific MeSH terms and keywords regarding that available or used. Therefore, we believe that our findings were only

influenced to a very limited extent by the fact that we may have missed potentially relevant studies. One of the other limitations of this study is that only one researcher independently examined article. At the other hand, because our needed data is accessible only in the full text of articles we included only article that linked to full text.

**Conflict of interests:** The authors declare no conflict of interest.

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**Table 2.** Lists advantages and disadvantages of each model to measuring TQ.

Quality measurement method	Subcategory of method	Application field	Advantage	Disadvantage
Medical record	electronic health record	Primary Care, hospital, medical practice	<ul style="list-style-type: none"> <li>➤ Increase sensitivity by coding information [13]</li> <li>➤ Reuse of data improves data quality and reduces the cost of secondary use of data [13]</li> <li>➤ Capture a larger denominator of patients [13, 21]</li> <li>➤ Don't adding burden to the care process [13]</li> <li>➤ Used for research and management process [13]</li> <li>➤ User friendly [10, 27]</li> <li>➤ Ease to update and use record [10, 27] and renew prescription [27]</li> <li>➤ Flexible to use in wide variety of settings [10, 11]</li> <li>➤ brings the clinical and process data together [10]</li> <li>➤ Easier to read for the patient [27]</li> <li>➤ Addressing the well documented challenges of overuse, underuse, and misuse of healthcare service [28]</li> </ul>	<ul style="list-style-type: none"> <li>➤ clinical data are stored outside the system and are not extractable [10, 11, 27]</li> <li>➤ Accurate extraction of data requires some text data, difficult to analyses [10]</li> <li>➤ retrospective, observational nature increase Possibility of confounding [11] lack of information about reasons for non-adherence [11]</li> <li>➤ lack of information on patients' actual medication [11]</li> <li>➤ High implementation cost (hardware and software) [27]</li> <li>➤ Impact on complex workflow is not well understood [28]</li> <li>➤ A modest positive or no significant impact on the quality measure of guideline adherence [28]</li> </ul>
	Paper Medical record	Primary Care, hospital, medical practice	<ul style="list-style-type: none"> <li>➤ Documented [7-9, 29]</li> <li>➤ Good medical record improve the quality of delivered care [15]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Overstate services [30]</li> <li>➤ Highest overstate services in physical examination and elements of the diagnostic process [29, 30]</li> <li>➤ Retrospective, observational nature increase possibility of confounding [7]</li> <li>➤ Documentation is imperfect reflection of actual care provided [7] imperfect recording and validity and reliability [8, 9, 14-16]</li> <li>➤ Uncertainty about validity and reliability and measurement [9, 14]</li> <li>➤ Errors in abstraction or transcription [14]</li> <li>➤ Difficult to use unstructured data [14, 29]</li> <li>➤ More expensive and less widely available [16, 23, 29]</li> </ul>
Medical record	Electronic quality monitoring	Primary Care, hospital	<ul style="list-style-type: none"> <li>➤ Less time consuming [12]</li> <li>➤ Less expensive than hand abstraction [12]</li> <li>➤ Quality improvement with timely data [12]</li> <li>➤ Formative [12]</li> <li>➤ The eQuality system achieved sensitivity (recall), specificity, and positive predictive value (precision) for automated quality assessment [12]</li> <li>➤ Electronic Data Capture (EDC) abstraction error rate was significantly lower than document audits [14]</li> <li>➤ Objectively quantifying data quality will provide a more comprehensive picture of a site's performance [14]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Most electronic health care information is stored as unstructured free text [12]</li> <li>➤ Longitudinal Medical Record (LMR) is often incomplete [31]</li> </ul>
administrative data	Chart review	Primary Care, hospital, medical practice	<ul style="list-style-type: none"> <li>➤ Can continuously monitor performance locally [17]</li> <li>➤ Prospective monitoring of risk-adjusted mortality shows a persistent and real change [17]</li> <li>➤ Respond rapidly with suitable investigation and corrective strategies if necessary [17]</li> <li>➤ Use of techniques such as the E-O chart and the risk-adjusted p chart minimise delays between data collection and formative analysis [17]</li> <li>➤ The E-O chart offers a rapid and qualitative plot [17]</li> <li>➤ The risk-adjusted p chart offers an easy formal statistical test [17]</li> <li>➤ Accuracy of the clinical databases such as chart review is high [18]</li> <li>➤ Can be generalized to other organization with HER [18]</li> <li>➤ Simple and easy process measures [18]</li> <li>➤ Average reliability is high [30]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Poses little additional burden in cost and infrastructure [17, 20, 21]</li> <li>➤ Recording bias because of time constraints on outpatient visits [20, 21]</li> <li>➤ Adjustments for case-mix variation are insufficient, thereby limiting direct comparisons of quality of care across different sites or delivery systems [20]</li> <li>➤ Recording bias - everything that happens in the clinical encounter is not written down because of time constraints [20-22]</li> <li>➤ Administrative data may also be incomplete within mental health programs [21]</li> <li>➤ The chart accurate than vignettes for recording treatment plans [20]</li> <li>➤ Constrained to small samples [21]</li> <li>➤ Prone to inter-reviewer variation [21]</li> <li>➤ not clinically detailed [22]</li> <li>➤ behavioral factor is quite poor in birth certificate reliability [22]</li> </ul>
	discharge data	hospital	<ul style="list-style-type: none"> <li>➤ Data available to most health plans [32]</li> <li>➤ Encrypted before they are submitted [19]</li> <li>➤ measure continuity of insurance, access, and utilization [19]</li> <li>➤ Includes both claims and encounter data [19]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Administrative data limit the types of clinical actions [22, 32, 33]</li> <li>➤ Generally depend on process measures rather than output, functional status, and mortality [32]</li> <li>➤ Difficulties in obtaining clean data [19, 33]</li> </ul>

			<ul style="list-style-type: none"> <li>➤ Comparison is conceptually feasible [19]</li> <li>➤ Standardization of data collection and reporting methods [19]</li> <li>➤ Birth certificate data is very reliable when compared to medical record [22]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Hospital discharge data were less sensitive for pregnancy complications [22]</li> <li>➤ fail to distinguish between preexisting conditions and complications that occur after hospital admission [23]</li> <li>➤ Clinical data are more accurate than administrative data [22, 23]</li> <li>➤ Behavioral factor is quite poor in birth certificate reliability</li> </ul>
consumers' reported quality data		Primary Care, hospital, medical practice	<ul style="list-style-type: none"> <li>➤ Patients report valuable information on the presence or absence of tests (Patients report), [16, 31, 34-37]</li> <li>➤ Patients report their own health conditions that was not noted in the problem list [31]</li> <li>➤ Patients have important knowledge of their basic health maintenance [31, 36]</li> <li>➤ Assist physicians in recording information and correct information in the records [31, 37]</li> <li>➤ Increase communication between provider and patient [30, 31]</li> <li>➤ Reflect educational feedback [38]</li> <li>➤ More sensitive than medical record [37]</li> <li>➤ Easy and cheap to collect [16, 39]</li> <li>➤ Consumers are, "co-producers" and provide first hand data [16, 37]</li> <li>➤ Bias from personal characteristics is not so strong [36]</li> <li>➤ It is amenable to large surveys independent of the practitioner and practice setting [16, 37]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Patient experiences of care were modestly correlated with clinical process measures [40]</li> <li>➤ Patient experiences of care were not correlated with clinical outcomes [37, 40]</li> <li>➤ Patients' ability to report specific results of tests was less reliable than data in the Longitudinal Medical Record (LMR), [16, 31, 37]</li> <li>➤ LMR is often incomplete [31]</li> <li>➤ Older patients in primary care did not distinguish between technical quality of care and other aspects [35]</li> <li>➤ Patients' own assessments not related to ascertained records based measures of technical quality [35, 41]</li> <li>➤ lack an understanding of the degree to which technical quality varies and the need to protect oneself from poor care [16, 37]</li> <li>➤ recall bias [16, 39, 41]</li> <li>➤ non-respondent bias [16]</li> <li>➤ over represents patients with higher health literacy, more optimal care or more interest in self-care [16]</li> </ul>
		groups of physicians	<ul style="list-style-type: none"> <li>➤ Easily administered [20]</li> <li>➤ Less costly [20]</li> <li>➤ Can be used in all types of clinical practices [20]</li> <li>➤ Hold promise for case mix [20]</li> <li>➤ Can be used among different providers and organizations [20]</li> <li>➤ Vignette scores appeared to reflect actual physician practice as recorded from SP visits, resulting in higher criterion validity.</li> <li>➤ Useful way to measure physician practice in an outpatient setting [20]</li> <li>➤ More accurately than did chart abstraction scores, resulting in better content validity, also were more effective at measuring variations in quality between the 2 study sites [20]</li> <li>➤ Compare to chart abstraction, yielding good face validity [20]</li> <li>➤ Useful way to measure quality of groups of physicians [20]</li> <li>➤ Used to measure the impact of organization reforms or policy changes [20]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Uncertainty and controversy about result about actual clinical practice or merely physician competence [20], only reflect knowledge [20]</li> <li>➤ Should not be used to assess individual-level performance [20]</li> <li>➤ Overestimate the quality of the physical examination [20]</li> <li>➤ Inconsistently assess the quality of the treatment plan [20]</li> </ul>
		Individual physicians	<ul style="list-style-type: none"> <li>➤ Overall rate of agreement and Sensitivity standardised patients' checklists against the audio recording transcripts is high [25]</li> <li>➤ Used when highly accurate measures of quality are needed [25]</li> <li>➤ Well suited for cross system comparisons [25]</li> <li>➤ Evaluating competence in specialties by criterion standard [25]</li> <li>➤ Standardised patients are valid and reliable [20, 25], show variation [20]</li> <li>➤ A practical gold standard [20]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Costly to train and implement [20, 25]</li> <li>➤ Problem in providing presentations perfectly adjusted for case mix [25]</li> <li>➤ Has not been prospectively evaluated [25]</li> <li>➤ Difficult to validating standardised patients' measurements of quality of care in actual primary practice [25]</li> <li>➤ False positive rate of standardised patients' assessments exceeded the false negative rate.</li> <li>➤ Assessed only verbal communication [20, 25]</li> <li>➤ Not possible to blindness (ethical and logistical reasons) [20, 25]</li> <li>➤ Can measure quality through a single encounter or even a short series of visits (continuity) [25]</li> <li>➤ Require more intrusion into a physician's practice [20]</li> </ul>

				➤ Wasting the opportunity cost of the physician [20]
	composite method	public sector, Hospital, health plan, medical practice	<ul style="list-style-type: none"> <li>➤ Data sources were readily available for large-scale analysis [13, 23, 42]</li> <li>➤ Easily understood number or rating [43]</li> <li>➤ Performances were displayed as indicator-based and case-based adherence subject to potential overuse and underuse [42, 43]</li> <li>➤ Continuum of care for each condition [42]</li> <li>➤ Can be used for benchmarking purposes without additional expense [23]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Calculating performance measures by administrative data may significantly biased quality reports [13]</li> <li>➤ Claims-based quality measures overstate performance [13]</li> <li>➤ Secondary data and less robust [42]; limited scope [42] and limited and incomplete sources [21]</li> <li>➤ Administrative data may be incomplete within mental health programs [21]</li> </ul>
	Prescription claims	Encounter setting	<ul style="list-style-type: none"> <li>➤ pharmaceutical claims, which are more likely to be accurately reported than other forms of encounter data [44]</li> </ul>	<ul style="list-style-type: none"> <li>➤ quality measures will be biased by missing data [44]</li> </ul>
Healthcare providers		groups of physicians	<ul style="list-style-type: none"> <li>➤ No difference was found between nurses' and patients' scores on the action subscale [26]</li> </ul>	<ul style="list-style-type: none"> <li>➤ There were differences in patients' and nurses' assessments of the quality of care in postoperative pain management [26]</li> <li>➤ Well performed people slightly underestimate their performance, poor performers consistently and greatly overestimate [15, 45]</li> <li>➤ Self-reported adherence to the guideline does not guarantee their compliance with guidelines [15, 45]</li> <li>➤ As questionable value of self-assessment and peer review compared with measuring actual performance [15]</li> <li>➤ Clinician surveys are dependent on the willingness and interest of the clinician in participating [16]</li> </ul>
observation	Video techniques	groups of physicians	<ul style="list-style-type: none"> <li>➤ Used to develop best practices for brief, risky, but beneficial tasks [24]</li> <li>➤ Reusable record [24]</li> <li>➤ Continuous data whereas observational data only collect information noted by the observer [24]</li> <li>➤ Clinicians could review their own activities and for analysts to extract qualitative and quantitative data [24]</li> <li>➤ Revealed cognitive aspects [24]</li> <li>➤ Useful as stimulus material and powerful feedback and training tool [24]</li> <li>➤ Expanded analysis of time critical brief or uncertain events by repeated replays or even frame by frame analysis [24]</li> <li>➤ No medico legal subpoenas and no employment related or liability issues have experienced [24]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Infeasible to obtain patient consent in the emergency circumstances[24]</li> <li>➤ Medico legal, confidentiality, privacy, and employment performance related risks [24]</li> <li>➤ Difficult to interpret complex dynamic tasks were performed by experts in their real workplace [24]</li> </ul>
	Direct observation	Individual physicians	<ul style="list-style-type: none"> <li>➤ Could be a gold standard if physicians were adequately masked to the measurement method [20]</li> </ul>	<ul style="list-style-type: none"> <li>➤ Logistical and ethical difficulties in directly observing physicians while they care for patients [25]</li> <li>➤ Requires the presence of a trained observer (or observers) [24]</li> <li>➤ Existing blindness problem [24]</li> <li>➤ Existing problem of informed consent [24]</li> </ul>