

A Systematic Review of Quality Components of Patients' Medical Record in Iranian Hospital

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ABSTRACT

Background: Quality of patients' medical records is important in patient management, safety, decision making and continuation of care. Patients' medical record data are also used in clinical research, health system services and management, medical forensic management, quality improvement, health care financial management, and risk management.

Objective: The aims of the study were to determine the quality of the components of hospital patients' medical records.

Methods: The criteria selected for systematic searching were published articles in English from 1995 to 2014 for patient medical record quality components. The search terms were hospital patient medical record, reliability, accuracy, completeness, availability and accessibility. The study was carried out from 2013 to 2014 using public domain databases which include PubMed, Cochrane and CINAHL.

Results: Over 2600 citations from the databases were extracted. Based on the criteria of the study 344 articles were selected for review. Subsequently, 7 articles were selected for reliability, 11 for accuracy, 18 for completeness and 9 for availability and accessibility. These articles were subjected to an in-depth review. Reliability of data in patients' medical record is a requisite for accuracy and completeness of clinical data. The reliability scores of the studies reviewed ranged from 49% to 99%, while accuracy of patients' medical record ranged from 73% to 95%. The reviewed studies also showed completeness of patients' medical record ranging from 41.5% to 93%, while availability and accessibility scores ranged from 58% to 94.3%.

Conclusion: This review had contributed to a better understanding of the quality of patients' medical record. Reliability, accuracy, completeness and accessibility of patient medical record showed a wide range of quality of patients' medical record. Good quality of patients' medical record is essential for patient care and through preventing medical error. This review also revealed the importance of intervention to improve quality of patient medical record.

Keywords: Patients' medical record, quality, reliability, accuracy, completeness, accessibility

1.0 Introduction

Patients' medical record refers to systematic documentation of a single patients, medical history and care across time within one particular health care provider's jurisdiction (CMS, 2011 - Personal Health Record). Patients' medical records are kept by every health care provider; doctors, general practitioners, surgeons, physiotherapists, nurses and others health care providers. Although different health care provider note different information, the goal of keeping records is the same: The patients' medical record includes a variety of types of "notes" entered over time by doctors and nurses, recording observations and administration of drugs and therapies, orders, investigations results, x-rays reports, and referral. These records play an important role in patient diagnostic process, patients' treatment, clinical research, hospital and health services system, quality improvement, procurement, risk management and decision making. The medical record serves as the central repository for planning patient care and documenting communication among patient and health care provider and professionals contributing to the patient's care. Therefore, quality of data is an important component of patients' medical record. Poor quality of patients' medical record may lead to wrong diagnosis and error in patient treatment, wrong disease prevalence report, and poor decision making outcomes (Tierney, 2001). In the absence of "quality" medical records, or if medical records are incomplete, these health care providers will not have a clear picture of the patient's past history and, as a result, will not be able to properly deal with new medical needs of patients' or new issues in health system. It is vital that doctors and nurses are well-versed in patients' medical record before they attained to the patient's current medical treatments.

The evaluation of data quality of patients' medical record is an important procedure for healthcare professionals and stakeholders, Data quality of the patients' medical record is judged based on completeness, accuracy, reliability (Young et al, 2010) and accessibility to it. Accuracy, reliability and completeness were used as one common measurement to assess quality of patients' medical record (Newcomer, 1998), however in this review accuracy, reliability, completeness and accessibility are measured separately. It is important that when key clinical findings, laboratory and imaging diagnostic assessments are done, all relevant information from those assessments is recorded (completeness). Additionally, data recorded should correctly reflect the sources from which they are drawn (accuracy). In some studies accuracy refers to correctness and misplaced records (Abbaspour et al., 2013; Jahanbakhsh & Saghaeyannejad Isfahani, 2010). Where there is no "gold standard" source document is available to check the "true" value of a given data element, then multiple recordings of that element within and across documents should be consistent (reliability). Here, reliability defined as consistency and stability of data in several sections of patient records, the accuracy bring reliability of data and evaluated based on the International Classification of Disease (ICD) (WHO, 2002). Finally the data must be available when needed and who require using it (accessibility). Because of primary healthcare systems in different countries and the role of physician in referral system, the gold standards for evaluation of accessibility commonly refers to completeness and availability of discharge summary in patient records (Molla et al, 1994).

Achieving high data quality is challenging in any setting and especially in resource-poor settings (Young et al, 2010), especially in developing countries. Considering the constraints, this review was conducted with the aims of determining the range of medical record quality and definitions for medical record quality components in term of accuracy, completeness,

reliability and accessibility. Because of lacking of such study in developing countries, this review mainly used studies from developed countries.

2.0 Materials and Methods

The criteria selected for systematic searching were published articles in English from 1995 to 2014 for patient medical record quality components. The study was carried out from 2013 to 2014 using public domain databases which include PubMed, Cochrane and CINHAL. The search terms were included keywords at least one of the following words related to patients' medical record quality; medical record, quality of data in healthcare, data quality, medical record components, reliability, accuracy, completeness and accessibility and availability, legibility, inaccuracy, incompleteness and inaccurate. A manual search of studies most frequently cited in automatically selected studies was also performed. The search duration for articles retrieval was from 1995 till 2014.

Studies were included if they were scientific articles published between 1995 to 2014 with full text provided, written in English language, and followed appropriate arms of randomized controlled trials (RCT) design, cross-sectional design, or retrospective design for data collection. Studies must be conducted in the hospitals among the population of patients' medical records of patients in hospital. In addition, studies were included if they assess any of the following quality components of patients' medical record; reliability, accuracy, completeness and accessibility. A study defining accessibility as availability of patients' medical record also included in the review. The studies included in the review also should have patients' medical record and its content are common with patients' medical records in Iran as defined by Ministry of Health & Ministry of Education (MOH&ME) of Iran.

Studies were excluded if they took place not in the hospital setting, such as primary health centres, general practitioners (GPs), nursing care and rehabilitation centres. Each of the studies reviewed will be evaluated using a structured form for evaluation developed by researcher.

3.0 Results and Discussion

The databases searched were carried out between 2013 and 2014, these searches retrieved over 1200 citations from CINHAL, over 800 from PubMed and 326 from Cochrane databases. In the next stage, manually reviewed titles and abstracts of citations yielded more than 344 articles potentially relevant to patients' medical record quality components. The studies subsequently evaluated and scored according to review criteria. The results of evaluation yielded a total of 38 studies to be final reviewed based on patients' medical record quality components as below- some of the studies consist of more than one quality components:

Reliability : 7 studies

Accuracy : 11 studies

Completeness : 18 studies

Accessibility : 9 studies

3.1 Reliability

The first component of quality of patients' medical record is reliability. Reliability of data in a patient record had various definitions. Reliability in medical record referring to data stability and consistency that is necessary for continuation of patient care. Reliability is a requisite for accuracy and completeness of clinical data. Seven studies as listed in Table 1 had a common definition on reliability and studied consistency of clinical data. Selected patients' medical record for reliability components are from 2001 to 2014 and mostly are from developed countries. Only one out of 7 selected studies were intervention design (Metz et al 2011), the others were cross-sectional study design (Marshall et al, 2003; Thoroddsen et al, 2013), and retrospective study (Chelis et al, 2001; Tyree et al, 2006; Dentler et al, 2014; Hendren et al, 2014). The reliability scores of studies reviewed were ranged from 53 to 99% as in Table 2.

Table1: Methodological comparison of reliability evaluation of patients' medical record

	Author	year	Country	Types Of Study	Reliability %
1.	Chelis	2001	USA	Retrospective	99
2.	Marshall	2003	USA	Cross Sectional	53
3.	Tyree	2006	USA	Retrospective	69
4.	Metz	2011	USA	Intervention	89 - 96
5.	Thoroddsen	2013	Iceland	Cross Sectional	60
6.	Dentler	2014	Netherland	Retrospective	87
7.	Hendren	2014	USA	Retrospective	90

Researchs on quality improvement study evaluates patient data on the quality of data entry in the patients' medical record. The data will be less useful if they were unreliably entered, and also less benefited for patient management. Researchers in their studies also used several sources and variables for measuring reliability. Thoroddsen et al.(2013) went through patient history and progress note records for patients in his study among patients with pressure ulcers, while Tyree et al (2006) used insurance companies' documentations in his study among patients with genital tract infection for men and women. Other researchers like Marshall et al (2003) surveyed of chronic disease using electronic medical records (EMR); while Metz et al (2011) used intervention study design in his study among mothers undergone ultrasound screening for prenatal and had showed improved reliability of data in patients' medical record. Dentler et al. (2014) and Henderen et al. (2014) had surveyed the reliability of documentation among patients with colon and sigmoid cancer.

The reliability score's of the studies is ranged from 53% to 99%. This review found that the reliability scores are different depending on the sources of data and variables used in each

studies. This review also showed that study design didnot influenced outcome of the reliability score's. Study using EMR showed lowest reliability score's (Marshall et al, 2003).

Table 2: Reliability patients' medical record of the selected studies

Author	Study design	Study population	Source of data and scope	Variables	Results (Reliability Score)
1. Chellis et al., 2001	Retrospective	5000 patient records (6 years)	Primary diagnosis & discharge diagnosis	Evaluates errors in diagnosis	99
2. Marshall et al., 2003	Cross-sectional	154	Electronic medical record all diagnosis	Chronic diseases	53
3. Tyree et al, 2006	Retrospective	3 years period	Two insurance companies – all diagnosis	4 items in ICD9 for genital tract in men and women	69
4. Metz et al., 2011	Intervention	340	First trimester procedures screening tests using ultrasound	Prenatal tests	From 89 to 96
5. Thoroddsen et al, 2013	Retrospective	45	Patient history medical diagnosis progress note	Pressure ulcers	60
6. Dentler et al, 2014	Retrospective	75	Patient record	Colorectal cancer	87
7. Hendren et al., 2014	Retrospective	291	11 tumor registry and 20 medical records	Rectal cancer	90

3.2 Accuracy

Accuracy of data in medical record is referring to data quality and medical records integrity, which is importance quality component of patients' medical record. It is a quality control method for patients' medical records. It is importance data used for diagnosis and management of patient condition , therefore data entered into patients' medical record needs strengthening on its accuracy (Green & Wintfeld, 1995). It is essential for a physician to be sure of the consistency and stability (reliability) of his diagnosis, care and accomplished acceptable treatment regarding medical protocols and application of coding based on ICD.

There were 11 studies that fulfil criteria for accuracy of patients' medical record (Table 3). Most researchs were carried out in United States of America (USA) (5 studies) with other studies from Australia (1 study), Finland (1 study), Iran (2 studies), Spain (1 study) and UK (1 study). Three of the studies are intervention (Yarnal et al, 1995; Oruetta et al, 2006; Ganz et

al, 2012), and cross- sectional (Pringle et al, 1995; Silfen, 2006; Farzandipour et al, 2009) or retrospective studies (Aronsky & Haug, 2000; Wood, 2001; Hayrinen et al, 2008; Akhlaghi et al, 2009).

Table 3: Methodological comparison of accuracy studies

	Author	Year	Country	Methodology	Sample size	Accuracy
1.	Yarnall et al	1995	USA	Intervention	570	76%
2.	Pringle et al	1995	UK	Cross - sectional	37455	95%
3.	Wagner& Hogan	1996	USA	cohort	399	83%
4.	Aronsky & Haug	2000	USA	Retrospective	226	79%
5.	Wood	2001	Australia	Retrospective	317	84%
6.	Orueta et al	2006	Spain	Intervention	87806	97%
7.	Silfen	2006	USA	Cross - sectional	99281	95%
8.	Hayrinen et al	2008	Finland	Retrospective	299	73%
9.	Akhlaghi et al	2009	Iran	Retrospective	739	40-62.5%
10.	Farzandipour et al	2009	Iran	Cross-sectional	246	85%
11.	Ganz et al	2012	USA	Intervention	215	85.5%

As shown in Table 3 the accuracy of patients' medical record ranges from lowest score of 40% to highest score of 97%. The reviews indicate that the accuracy of patient medical records is dependence on the complexity of patients' conditions. Akhlaghi et al in study among patients medical records of burn cases obtained only 40-62.5% accuracy of patients medical records studied (Akhlaghi et al, 2009). Similar finding (accuracy score: 76.5-85.5%) by Ganz et al in his study among fall and urinary incontinence cases (Ganz et al, 2012). The review also showed that intervention study design showed improvement in accuracy of ICD coding (Ganz et al, 2012; Orueta et al, 2006; Yarnall et al, 1996: by 20%, 9% and 14% respectively). As shown in Table 4, a comprehensive study with high number of sample size (Pringle et al, 1995; Orueta et al, 2006; Silfen, 2006) also indicate higher accuracy score as compare to studies with smaller sample size (Yarnall, et al 1995; Wagner & Hogan, 1996; Aronsky & Haug, 2000; Woods, 2001; Häyrynen et al, 2008; Akhlaghi et al, 2009; Farzandipour et al, 2009; Ganz et al, 2012).

Jahanbakhsh showed that wrong coding or absent of coding was related to incomplete final diagnosis (Jahanbakhsh et al, 2010), and physician need to give attention to recording final diagnosis (Alipour et al., 2013). Another study in teaching hospital in Tabriz described that other diagnosis in burn patient should be considered by physician and recorded properly (Abbaspour et al., 2013; Jahanbakhsh & Saghayannejad Isfahani, 2010). Farzandipour et al in a cross sectional study in a teaching hospital in Kashan described that better documentation especially in diagnosis was necessary by physicians to reach to final diagnosis (Farzandipour et al, 2009). The results from above study explicitly indicate the need for defining any absent or wrong coding in patient records, and need for intervention before final diagnosis recording to improve accuracy of the coding of the patient diagnosis.

Table 4: Accuracy of patients' medical record in selected studies

	Author	Study design	Study population	Source of data and scope	Results %
1.	Yarnall, et al 1995	Intervention	300	Electronic patient records – all diagnosis	62 – 82
2.	Pringle et al, 1995		37455	Diabetes Mellitus and Glaucoma	92 & 97
3.	Wagner & Hogan, 1996	Retrospective	117	Electronic patient records – all diagnosis	83
4.	Aronsky & Haug, 2000	Retrospective	226	Pneumonia	79
5.	Woods, 2001	Retrospective	317	Compared between medical record diagnosis and database	84
6.	Oruetta et al, 2006	Intervention	87306	Primary health care physicians in computerized medical records	83 -97
7.	Silfen, 2006	Retrospective	99281	Emergency care	95
8.	Häyrinen et al, 2008	Retrospective	230	Surgery records	73
9.	Akhlaghi et al, 2009	Retrospective	735	Burn wards	40-62.5
10.	Farzandipour et al, 2009	Cross sectional	246	Diagnosis on documentation	85
11.	Ganzet al, 2012	Intervention	215	Falls and urinary incontinence	76.5-85.5

A study in Iran hospital revealed that accuracy of coding ranged from 40 to 62.5% and major reasons for low accuracy was illegible and incomplete of diagnosis by physicians (Akhlaghi, Raeissi, & Kazemi, 2009). It also showed that wrong or absent of ICD coding resulted with incomplete final diagnosis by physician (Alipour et al., 2013). In another study on the accuracy of diagnosis among burnt patient revealed similar result (Abbaspour et al., 2013; Jahanbakhsh & Saghaeyannejad Isfahani, 2010). Farzandipour in a cross sectional study in a teaching hospital in Kashan of Iram described that better documentation especially in diagnosis was necessary for physicians in patient care decision making (Farzandipour, Sheikhtaheri, & Shokrizadeh Arani, 2009). The results of the studies revealed the important of intervention to improved accuracy of quality of patient medical record.

3.4 Completeness

Completeness of the patients' medical record is one of the most important quality indicators of patients' medical records. Completeness of patient record is an important requirement for patient safety, quality of patient care and in a broader perspective developing a robust clinical decision making process (Barreto et al, 2008). Completeness can have beneficial effects on data quality.

In this review there were 18 studies worldwide that met the study criteria of completeness of patients' medical record. The studies reviewed were range from 1995 to 2014 (Table 5). Assessment of completeness in patients' medical records had various points of reviewed items. Number of items that was surveyed varied from 1 (Bradley et al, 2005) to 32 (Setareh et al, 2011). The completeness of reviewed patients' medical records was ranged from 26 to 98% and was not dependent on number of surveyed items (Table 5). The number of items measured in various studies for completeness quality indicators are varied: Bradley (2005) used only one item, while Setareh (2011) measured 43 items from patients' medical record as completeness quality indicators. A number of researchers went through patient records like progress note, clinical note, vital signs, patient chart and consultation (Attena et al., 2010; Menke, Broner, Campbell, McKissick, & Edwards-Beckett, 2001; Miller & Velanovich, 2010; Pringle et al., 1995; Szpunar et al., 2008; Wagner & Hogan, 1996). While in another study researcher's reviewed specific disease or procedures (Cisneros-Franco et al., 2013; Dentler, K., Cornet, R., ten Teije, A., Tanis, P., Klinkenbijn, J., Tytgat, K., & de Keizer, 2014; Ganz et al., 2012; Hendren et al., 2014; Menke et al., 2001; Opila, 1997). In Table 6 below indicated various items or variables studied by researchers found in this review.

Table 5: Methodological comparison of completeness in selected studies

Author	Year	Country	Type of study	Sample size	No. items	Completeness %
1. Pringle	1995	UK	Retrospective	1000	14	87
2. Walraven	1995	Canada	Descriptive	135	6	98
3. Wagner	1996	USA	Cohort	117	34	93
4. Opila	1997	USA	Intervention	235	12	86
5. Menke	2001	USA	Intervention	1970	8	92
6. Bradley	2005	USA	Cross Sectional	60363	1	60.2
7. Karbasi	2006	Iran	Cross Sectional	527	18	67
8. Szpunar	2008	USA	Intervention	367	12	58
9. Attena	2010	Italy	Intervention	1320	11	82.7
10. Miller	2010	USA	Retrospective	681	5	26
11. Minville	2010	French	Cross Sectional	13899	10	72
12. Setareh	2011	Iran	Cross Sectional	2011	32	64
13. Hoseinpourfard	2012	Iran	Descriptive	400	15	64.6
14. Kern	2012	USA	Prospective	1336	10	67
15. Ganz	2012	USA	Intervention	215	7	84.5
16. Cisneros	2013	Mexico	Intervention	80	8	56.2
17. Dentler	2014	Netherland	Retrospective	75	14	86
18. Hendren	2014	USA	Retrospective	570	15	79.5

The review revealed that if the measuring items of completeness was to specific or number of items studied was small will resulted with the completeness score get lower percentage as shown in Figure 1 below (Bradley et al., 2005; Kern et al, 2014; Miller & Velanovich, 2010; Szpunar et al, 2008).

Completeness of patients' medical record discussed various aspects of patient records. The most common studied were reviewing physician performance in patient record and little on performance of other healthcare workers (Menke et al., 2001). Physicians usually completed the clinical reports like physical examination and studies showed that the completeness were high, but physicians put less attention on patient demographic status, patient satisfaction and social history (Miller & Velanovich, 2010; Wagner & Hogan, 1996). Other studies described that physicians less perform to complete the patient demographic and life style information like smoking, alcohol consumption, social class and ethnicity; and manual write up patient medical records was easier than data entry in electronic-record (Menke et al., 2001; Pringle et al., 1995).

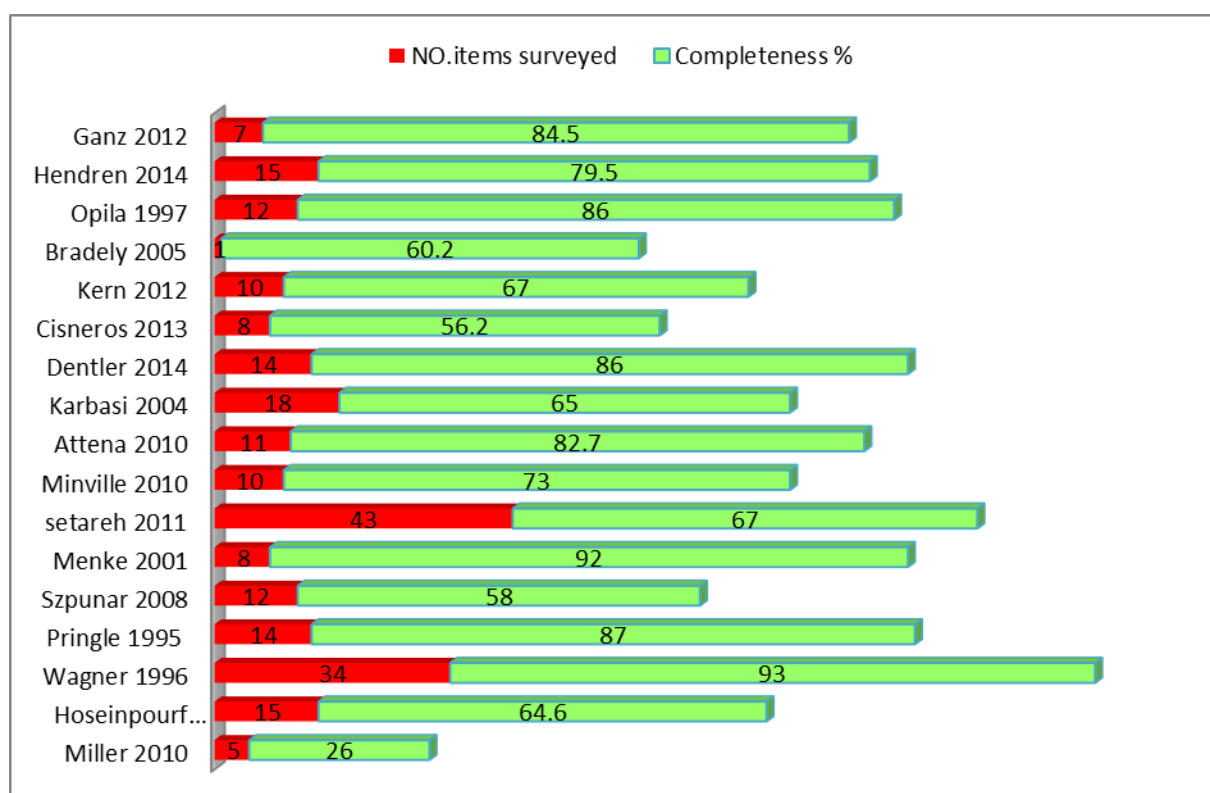


Figure 1: Comparison number of items in completeness review of patient medical records

Intervention study in quality of patients' medical record found that completeness of patients' medical records shows improvement before and after intervention (Attena et al, 2010; Szpunar et al, 2008; Bradley et al, 2005; Menke et al, 2001; Opila, 1997; Cisneros-Franco et al., 2013; Hendren et al, 2014 & Ganz et al, 2012). Most of the studies reviewed carried out intervention among physicians, but two of the studies went through completeness of patients' medical record for nursing plan and patient records (Hendren et al., 2014; Menke et al., 2001) and another two studies carried out the intervention for both (Ganz et al., 2012; Wagner & Hogan, 1996); the finding of these studies also shows improvement of completeness of patients' medical record after intervention. There were interventions for completeness of patients' medical records for specifies procedures and diagnosis; the improvement for completeness of patients' medical record for these studies were lower than others (Bradley et al., 2005; Cisneros-Franco et al., 2013; D'Amore, Sittig, & Ness, 2012; Ganz et al., 2012;

Kern et al., 2014; Vest, Kern, Silver, & Kaushal, 2014). The review indicated that intervention carried out for physician and other healthcare workers such as nurses improved their commitment for completeness of clinical documentation (Hoseinpourfard, Abbasi Dezfouli, Ayoubian, Izadi, & Mahjob, 2012).

Table 6: Completeness of patient records in selected studies

Author	Study design	Sample size	Source of data	Variables	Results %
1. Attena et al., 2010	Intervention	660	Patient records	Patient's identity, patient's history, physical examination, days of hospital stay, description of surgical procedures, letter of discharge, patient chart	48.3 to 82.7
2. Szpunar et al., 2008	Intervention	580	Vital signs	Quick vital screen	0.7 to 58.5
3. Bradley et al., 2005	Intervention	826	Beta-blocker and warfarin	Unavailability of emergency department and inpatient bed	1.9 & 23.2
4. Miller & Velanovich, 2010	Retrospective	681	Clinical note		86.6
5. Wagner & Hogan, 1996	Retrospective	117	34 selected items		93
6. Pringle et al., 1995	Cooperative between manual & EMR	1000	Consultation	14 selected items	87.5 & 55
7. Menke et al., 2001	Intervention	1970	Computerized clinical documentation	Nursing plan notes nursing diagnosis	8% to 91% 6% to 93% 7% to 92%
8. Opila, 1997	Intervention	235	Progress note and review in laboratory, imaging and consultation	12 items in charts documentation,	0.60±0.20 to 0.71±0.13 & 0.86±0.12
9. Dentler et al., 2014	Retrospective Compare EMR & manual	75	Colorectal cancer surgery	Operation date, birth, day procedure operation, diagnosis cancer & stage, colonoscopy data chemotherapy, follow up, radiotherapy date.	86% manual & 50% EMR
10. Cisneros-Franco et al., 2013	Intervention	80	Patients with epilepsy	Seizure type Neurology side effects, aetiology, safety counselling, physical examination, EEG, neuroimaging	41.5 to 64.5%
11. Hendren et al., 2014	Intervention	383	15 items in patient records	Cancer registry	79.5
12. Ganz et al., 2012	Intervention	215	Patient records and structured visit note	Patient with fall experience	61.5 to 84.5
13. Kern, Edwards, & Kaushal, 2014	Prospective cohort	143489	Patient records 10 quality measures	Eye examination, HbA testing, LDL cholesterol for diabetes patients, breast cancer screening, chlamydia screening, colorectal cancer screening, Asthma medication, pharyngitis testing, treatment for children with upper respiratory infection	
14. Hoseinpourfard et al., 2012	Retrospective	400	15 items of patient records	Patient documentation standards	64.6

3.4 Accessibility

The levels of patient's care include primary level, secondary level and tertiary level. There should be proper communication between health care professionals within health system regarding care of the patient's. Availability or accessibility of information of patients' medical record that communicate efficiently is important in continuity of patient care. Accessibility to clinical data in patients' medical record is the fourth components of patients' medical record quality. Accessibility of patients' medical record or clinical data is important for patient management to prevent medical error. The accessibility studies ranged from 1995 to 2014 and all studies had included availability and completeness of discharge summary as items studied.

Table 7: Methodological comparison of availability and completeness of discharge summary in selected studies

Author	year	Country	Methodology	Sample size	Availability	Completeness
Walraven	1995	Canada	Descriptive	135	95	69.7
Harlan	2010	USA	Intervention	2530	96	90
Callen	2008	Australia	Descriptive	245	100	72
Bolton	2001	Australia	Intervention	346	96	90
Legualt	2012	Canada	retrospective	90	95	70
Mamo	2014	Ireland	Retrospective	45	80	86.1
Were	2009	USA	Retrospective	668	99.2	67
Chan	2014	Australia	Intervention	88	100	58
Neufeld	2013	USA	Intervention	185	100	94.3

This review includes 9 studies that fulfil patients' medical record accessibility criteria. The studies were from 1995 to 2014 (Walraven & Weinberg, 1995; Harlan et al, 2010; Callen et al, 2008; Bolton, 2001; Legualt et al, 2012; Mamo, 2014; Were et al, 2009; Chan et al, 2014; and Neufeld et al, 2013). These studies were listed as in Table 7 above.

Figure 2 shows availability of patients' medical record in most of the studies was at the range of 80% to 100%. Mamo (2014) in study of small samples of patients' medical record in Ireland rated lowest availability for discharge summary, however in studies analysing larger numbers of patients' medical record rated higher scores on availability of discharge summary in patients' medical record [Callen et al (2008), Chan et al (2014) and Neufeld et al (2013)]. The completeness of discharge summary in patients' medical record was ranged from 58 to 94%, the highest rating was from Neufeld (2013) in his intervention study in USA rated completeness of discharge summary in patients' medical record of 94.3% after an intervention.

Quality of patients' medical record are important for efficient communication between health care professional and others health care allied workers to ensure quality and continuity of

patient's management or treatment (Walraven & Rokosh, 1999). Discharge summary of patient's medical record was the commonest items studied in assessing quality of patient's medical record. Discharge summary of patient's medical record were used as mean of communication between health care professional during referring patient for further management (Callen, Alderton, & McIntosh, 2008) or follow-up. Completeness, reliability and accuracy of discharge summary of patients' medical record prevented medical-error or wrong judgement by reviewing physician. In this review there are six studies assessing accessibility and completeness of patients' discharge summary in patients' medical record; Walraven&Rokosh (1999), Harlan et al (2010), Callen et al (2008), Bolton (2001), Chan et al (2014) and Neufeld et al (2013). The findings of these studies were summarized in Table 8 below.

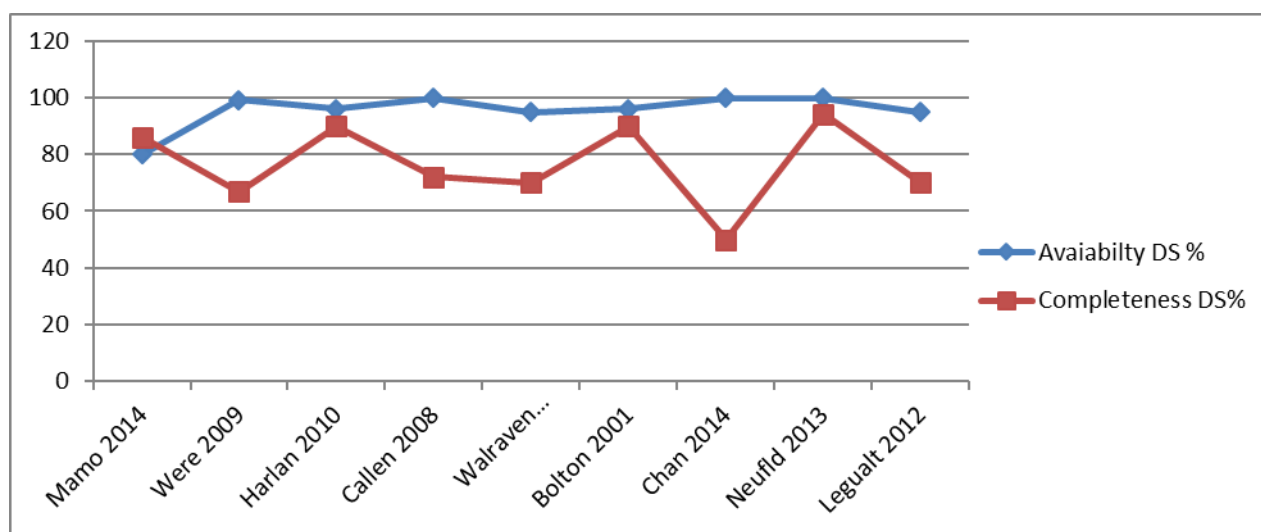


Figure2: Availability and completeness of discharge summary in selected studies

Intervention could be effective measure taken to improved quality of patients' medical record; reliability (Metz et al, 2011), accuracy (Yarnall et al, 1995; Ganz et al, 2012); completeness (Opilla, 1997; Menje et al, 2001; Szpunar et al, 2001; Attena et al, 2010; Ganz et al, 2012); and accessibility (Bolton, 2001; Chan et al., 2014; Harlan et al., 2010; Neufeld et al., 2013). A study in Sydney Australia for completion of discharge summary as a Cohort of 40 community revealed that discharge completion was increased 30% after an intervention program ($P < 0.001$; OR 11.9 CI 8.6 – 16.4) (Bolton, 2001). An intervention study was achieved in Prince Charles Hospital in Australia (Chan et al., 2014). The aim was to decrease time of discharge summary. The study found that all selected patient medical records had discharge summary but completion during first 48 hours of discharge for pre intervention was 45% and for post intervention was 55%. Other research also confirmed that completed and on time discharge summary prevent hospital readmissions (Legault, Ostro, Khalid, Wasi, & You, 2012; Neufeld et al., 2013; Vest, Kern, Silver, & Kaushal, 2014).

Table 8: Accessibility and completeness of discharge summary in selected studies

Author	Study design	Study population	Source of data	Variables	Results %
Carl Van Walraven & Rokosh, 1999	Retrospective		56 items related to discharge summary	Admission diagnosis, physical examination, laboratory results, complication in hospital, discharge diagnosis, discharge medication, medical problems, patient condition at discharge and follow up	7.4 mean
Harlan et al., 2010	Intervention	355	Discharge summary	Clinical elements, medication and follow up	62.3 to 83
Callen et al., 2008	Retrospective	245	Discharge summary	Discharge date, additional diagnoses, summary of the patient's progress in hospital, investigations, discharge medications, follow-up	Handwritten had less errors compare to electronic summary OR=1.74
Bolton, 2001	Intervention	278	Discharge letter	Completion discharge letter	30 to 90
Chan et al., 2014	Intervention	413	Patient records	Completion of discharge summary	45 - 55
Neufeld et al., 2013	Intervention	185	Discharge paper	8 required elements: Medication, allergies, activity, dietary, follow up, antibiotic, steroid instruction, wound care	61.8 to 94.2

4.0 Conclusion and recommendation

This systematic review based on 38 different published papers between 1995 and 2014 has contributed to better understanding of the quality of patients' medical record. Based on four components of quality of patients' medical record namely reliability, accuracy, completeness and accessibility wide range of the quality of patients' medical record. Good quality of patients' medical record is essential for patient care and to prevent medical error. This review also revealed the important of intervention to improved quality of patient medical record. Therefore health care organization must manage patients' medical record ad data in the medical record as an asset and adopt proactive decision making and oversight through asset management, information governance, and information management to achieve patients' medical record trustworthiness and ensured quality patient management.

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References

- Abbaspour, R., Langarizadeh, M., Ahmadi, M., (2013), comparative of burn coding in dead and live patients. *Management of Health Information (persian)*, 10(5), 684–691. Retrieved from <http://him.mui.ac.ir/index.php/him/article/view/856/2059>
- Akhlaghi, F., Raeissi, P., & Kazemi, S. (2009). Rate of Implementation of Standard Codes for Injuries, Burns and Poisonings in Teaching-Hospitals of the Iran, Tehran and Shahid Beheshti Medical Universities. *Management of Health Information (persian)*, 6(1), 23–34. Retrieved from <http://him.mui.ac.ir/index.php/him/article/view/120>
- Alipour, J., Karimi, A., Erfannia, L., Shahrakipour, M., Hayavi Haghighi, M. H., Kadkhoda, A., ... (2013). Validity of diagnosis coding with ICD10. *Management of Health Information (persian)*, 10(1). Retrieved from <http://him.mui.ac.ir/index.php/him/article/view/687/1599>
- Aronsky, D., & Haug, P. J. (2000). Assessing the quality of clinical data in a computer-based record for calculating the pneumonia severity index. *Journal of the American Medical Informatics Association : JAMIA*, 7(1), 55–65. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=61455&tool=pmcentrez&rendertype=abstract>
- Attena, F., Di Palma, M. A., Esposito, S., Galdo, V., Gimigliano, A., Parmeggiani, C., & Agozzino, E. (2010). Quality improvement of medical records in a teaching hospital. *Journal of Preventive Medicine and Hygiene*, 51(2), 53–6. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21155405>
- Barreto, E. A., Bryant, G., Clarke, C. A., Cooley, S. S., Owen, D. E., & Petronelli, M. (2008). Strategies and tools for improving transcription and documentation. *Healthcare Financial Management : Journal of the Healthcare Financial Management Association*, 62(8), 1–4. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/18709861>
- Bolton, P. (2001). A quality assurance activity to improve discharge communication with general practice. *Journal of Quality In Clinical Practice*, 21(3), 69–70. doi:10.1046/j.1440-1762.2001.00416.x
- Bradley, E. H., Herrin, J., Mattera, J. A., Holmboe, E. S., Wang, Y., Frederick, P., ... Krumholz, H. M. (2005). Quality improvement efforts and hospital performance: rates of beta-blocker prescription after acute myocardial infarction. *Medical Care*, 43(3), 282–92. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15725985>
- Callen, J. L., Alderton, M., & McIntosh, J. (2008). Evaluation of electronic discharge summaries: a comparison of documentation in electronic and handwritten discharge summaries. *International Journal of Medical Informatics*, 77(9), 613–20. doi:10.1016/j.ijmedinf.2007.12.002
- Chan, S., P Maurice, A., W Pollard, C., J Ayre, S., L Walters, D., & E Ward, H. (2014). Improving the efficiency of discharge summary completion by linking to preexisting

- patient information databases. *BMJ Quality Improvement Reports*, 3(1). doi:10.1136/bmjquality.u200548.w2006
- Chellis, M., Olson, J., Augustine, J., & Hamilton, G. (2001). Evaluation of missed diagnoses for patients admitted from the emergency department. *Academic Emergency Medicine : Official Journal of the Society for Academic Emergency Medicine*, 8(2), 125–30. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/11157287>
- Cisneros-Franco, J. M., Díaz-Torres, M. A., Rodríguez-Castañeda, J. B., Martínez-Silva, A., Gutierrez-Herrera, M. A., & San-Juan, D. (2013). Impact of the implementation of the AAN epilepsy quality measures on the medical records in a university hospital. *BMC Neurology*, 13(1), 112. doi:10.1186/1471-2377-13-112
- CMS (2011). Personal Health Records, CMS. April 2011. Retrieved 2012-04-14
- D'Amore, J. D., Sittig, D. F., & Ness, R. B. (2012). How the continuity of care document can advance medical research and public health. *American Journal of Public Health*, 102(5), e1–4. doi:10.2105/AJPH.2011.300640
- Dentler, K., Cornet, R., ten Teije, A., Tanis, P., Klinkenbijn, J., Tytgat, K., & de Keizer, N. (2014). Influence of data quality on computed Dutch hospital quality indicators: a case study in colorectal cancer surgery. *BMC Medical Informatics and Decision Making*, 14(1), 32. doi:10.1186/1472-6947-14-32
- Dentler, K., Cornet, R., ten Teije, A., Tanis, P., Klinkenbijn, J., Tytgat, K., & de Keizer, N. (2014). Influence of data quality on computed Dutch hospital quality indicators. *BMC Medical Informatics & Decision Making*, 14(1), 1–17. Retrieved from <http://ezproxy.upm.edu.my:2124/eds/pdfviewer/pdfviewer?sid=6735149f-2d65-4777-9899-b4ee74334bb1%40sessionmgr4005&vid=1&hid=4108>
- Farzandipour, M., Sheikhtaheri, A., & Shokrizadeh Arani, L. (2009). Accuracy of Procedure Coding Based on ICD9CM. *Management of Health Information (persian)*, 7(4). Retrieved from <http://him.mui.ac.ir/index.php/him/article/view/165>
- Ganz, D. a, Almeida, S., Roth, C. P., Reuben, D. B., & Wenger, N. S. (2012). Can structured data fields accurately measure quality of care? The example of falls. *Journal of Rehabilitation Research and Development*, 49(9), 1411–20. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/23408222>
- Green, J., & Wintfield, N. (1995). How accurate are hospital discharge data for evaluating effectiveness of care? *Medical Care*, 31(8), 719–31. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8336511>
- Greiver, M., Barnsley, J., Glazier, R. H., Harvey, B. J., & Moineddin, R. (2012). Measuring data reliability for preventive services in electronic medical records. *BMC Health Services Research*, 12(1), 116. doi:10.1186/1472-6963-12-116
- Harlan, G. a, Nkoy, F. L., Srivastava, R., Lattin, G., Wolfe, D., Mundorff, M. B., ... Maloney, C. G. (2010). Improving transitions of care at hospital discharge--implications for

- pediatric hospitalists and primary care providers. *Journal for Healthcare Quality: Official Publication of the National Association for Healthcare Quality*, 32(5), 51–60. doi:10.1111/j.1945-1474.2010.00105.x
- Häyrinen, K., Saranto, K., & Nykänen, P. (2008). Definition, structure, content, use and impacts of electronic health records: a review of the research literature. *International Journal of Medical Informatics*, 77(5), 291–304. doi:10.1016/j.ijmedinf.2007.09.001
- Hendren, S., McKeown, E., Morris, A. M., Wong, S. L., Oerline, M., Poe, L., ... Birkmeyer, N. J. (2014). Implementation of a hospital-based quality assessment program for rectal cancer. *Journal of Oncology Practice / American Society of Clinical Oncology*, 10(3), 120–9. doi:10.1200/JOP.2014.001387
- Hoseinpourfard, M., Abbasi Dezfouli, S., Ayoubian, A., Izadi, M., & Mahjob, M. P. (2012). Hospital Compliance with Clinical Documentation Standards: A Descriptive Study in two Iranian Teaching Hospitals. *International Journal of Hospital Research*, 1(2), 121–125. Retrieved from http://ijhr.iuums.ac.ir/article_3870_1.html
- Jahanbakhsh, M., & Saghaeyannejad Isfahani, S. (2010). Survey of Coder's Knowledge about Coding Guidelines in Hospitals in Isfahan. *Management of Health Information (persian)*, 7(1), 684–691. Retrieved from <http://him.mui.ac.ir/index.php/him/article/view/113>
- Kern, L. M., Edwards, A., & Kaushal, R. (2014). The patient-centered medical home, electronic health records, and quality of care. *Annals of Internal Medicine*, 160(11), 741–9. doi:10.7326/M13-1798
- Legault, K., Ostro, J., Khalid, Z., Wasi, P., & You, J. J. (2012). Quality of discharge summaries prepared by first year internal medicine residents. *BMC Medical Education*, 12(1), 77. doi:10.1186/1472-6920-12-77
- Mamo, J. P. (2014). Electronic discharge summaries--are they being done and do they have the required information? *Irish Medical Journal*, 107(3), 88–90. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/24757897>
- Marshall, S. F., Deapen, D., Allen, M., Anton-Culver, H., Bernstein, L., Horn-Ross, P. L., ... Ziogas, A. (2003). Validating California teachers study self-reports of recent hospitalization: comparison with California hospital discharge data. *American Journal of Epidemiology*, 158(10), 1012–1020. doi:10.1093/aje/kwg256
- McMillan, T. E., Allan, W., & Black, P. N. (2006). Accuracy of information on medicines in hospital discharge summaries. *Internal Medicine Journal*, 36(4), 221–5. doi:10.1111/j.1445-5994.2006.01028.x
- Menke, J., Broner, C., Campbell, D., McKissick, M., & Edwards-Beckett, J. (2001). Computerized clinical documentation system in the pediatric intensive care unit. *BMC Medical Informatics and Decision Making*, 1(1), 3. doi:10.1186/1472-6947-1-3

- Metz, J. P., Son, S. J., Winter, R. O., & Chae, S. (2011). Increasing timely and available prenatal studies by electronic health records. *Journal of the American Board of Family Medicine : JABFM*, 24(4), 344–50. doi:10.3122/jabfm.2011.04.100296
- Miller, J. M., & Velanovich, V. (2010). The natural language of the surgeon's clinical note in outcomes assessment: a qualitative analysis of the medical record. *American Journal of Surgery*, 199(6), 817–22. doi:10.1016/j.amjsurg.2009.06.037
- Molla S. Donaldson and Kathleen N. Lohr. (1994). Health Data in the Information Age: Use, Disclosure, and Privacy. *Regional Health Data Networks, Division of Health Care Services, INSTITUTE OF MEDICINE, NATIONAL ACADEMY PRESS*, Washington, D.C.
- Neufeld, N. J., Hoyer, E. H., Cabahug, P., González-Fernández, M., Mehta, M., Walker, N. C., ... Mayer, R. S. (2013). A Lean Six Sigma quality improvement project to increase discharge paperwork completeness for admission to a comprehensive integrated inpatient rehabilitation program. *American Journal of Medical Quality : The Official Journal of the American College of Medical Quality*, 28(4), 301–7. doi:10.1177/1062860612470486.
- Newcomer L.N.(1998). Perspective:physician, measure thyself. *Health Aff* 1998, 17(4):32-35.
- Opila, D. A. (1997). The impact of feedback to medical housestaff on chart documentation and quality of care in the outpatient setting. *Journal of General Internal Medicine*, 12(6), 352–6. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1497118&tool=pmcentrez&rendertype=abstract>
- Orueta, J. F., Urraca, J., Berraondo, I., & Darpón, J. (2006). Can primary care physicians use the ICD-9-MC? An evaluation of the quality of diagnosis coding in computerized medical records. *Gaceta Sanitaria / S.E.S.P.A.S*, 20(3), 194–201. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/16756857>
- Pringle, M., Ward, P., & Chilvers, C. (1995). Assessment of the completeness and accuracy of computer medical records in four practices committed to recording data on computer. *The British Journal of General Practice : The Journal of the Royal College of General Practitioners*, 45(399), 537–41. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1239405&tool=pmcentrez&rendertype=abstract>
- Silfen, E. (2006). Documentation and coding of ED patient encounters: an evaluation of the accuracy of an electronic medical record. *The American Journal of Emergency Medicine*, 24(6), 664–78. doi:10.1016/j.ajem.2006.02.005
- Somi MH., Piri Z., Delgoshaei B., Mahmoodi Z. (2004). Are the medical records of high quality in teaching hospitals? *Journal of Medical Education* Summer 2004 Vol.5, No.2
- Szpunar, S., Williams, P., Dagroso, D., Enberg, R., & Chesney, J. (2008). Improving the documentation of vital signs: a business reengineering efficiency study. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources*, 34(3), 171–8, 125. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/18419047>

- Thoroddsen, A., Sigurjónsdóttir, G., Ehnfors, M., & Ehrenberg, A. (2013). Accuracy, completeness and comprehensiveness of information on pressure ulcers recorded in the patient record. *Scandinavian Journal of Caring Sciences*, 27(1), 84–91. doi:10.1111/j.1471-6712.2012.01004.x
- Tierney W. Improving clinical decisions and outcomes with information: a review. *Int J Med Informat.* 2001; **62**: 1–9.
- Tyree, P. T., Lind, B. K., & Lafferty, W. E. (2006). Challenges of using medical insurance claims data for utilization analysis. *American Journal of Medical Quality: The Official Journal of the American College of Medical Quality*, 21(4), 269–75. doi:10.1177/1062860606288774
- Van Walraven, C., & Rokosh, E. (1999). What is necessary for high-quality discharge summaries? *American Journal of Medical Quality*, 14(4), 160–169. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-0033162169&partnerID=tZOtx3y1>
- Van Walraven, C., & Weinberg, a L. (1995). Quality assessment of a discharge summary system. *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, 152(9), 1437–42. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1337907&tool=pmcentrez&rendertype=abstract>
- Vest, J. R., Kern, L. M., Silver, M. D., & Kaushal, R. (2014). The potential for community-based health information exchange systems to reduce hospital readmissions. *Journal of the American Medical Informatics Association: JAMIA*, amiajnl-2014-002760. doi:10.1136/amiajnl-2014-002760
- Wagner, M. M., & Hogan, W. R. (1996). The accuracy of medication data in an outpatient electronic medical record. *Journal of the American Medical Informatics Association: JAMIA*, 3(3), 234–44. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=116305&tool=pmcentrez&rendertype=abstract>
- Were, M. C., Li, X., Kesterson, J., Cadwallader, J., Asirwa, C., Khan, B., & Rosenman, M. B. (2009). Adequacy of hospital discharge summaries in documenting tests with pending results and outpatient follow-up providers. *Journal of General Internal Medicine*, 24(9), 1002–6. doi:10.1007/s11606-009-1057-y
- WHO. (2002). *Medical Records Manual A Guide for Developing Countries* (p. 114).
- Wolk, A., Wang, E., Horak, B., Cloonan, P., Adams, M., Moore, E., ... Grossman, M. (2013). Effect of modest pay-for-performance financial incentive on time-to-discharge summary dictation among medical residents. *Quality Management in Health Care*, 22(4), 272–5. doi:10.1097/QMH.
- Woods, C. R. (2001). Impact of different definitions on estimates of accuracy of the diagnosis data in a clinical database. *Journal of Clinical Epidemiology*, 54(8), 782–8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/11470386>

- Yarnall, K. S., Michener, J. L., Broadhead, W. E., Hammond, W. E., & Tse, C. K. (1995). Computer-prompted diagnostic codes. *The Journal of Family Practice*, 40(3), 257–62. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7876783>
- Young P., Batya Elul B., Maulsby C., Winchell D., Mavie B., Fernandes R., Assan A.R., Gorrell S. & Nash D. (2010). Medical record completeness and accuracy at an HIV clinic in Mozambique, 2005-2006. *Health Information in Developing Countries*: Vol. 4, No. 2, 2010.