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**EVALUATION OF MEDICAL RECORDS  
COMPLETENESS IN THE ADULT CARDIOLOGY  
CLINIC AT NORK MARASH MEDICAL CENTER**

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**Yerevan, Armenia**  
**August, 2003**

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## Executive summary

**Background.** Based on findings of Record Review 2 Project (RR-2P) the first-visit structured encounter forms (SEFs) at the Adult Cardiology Clinic (ACC) were redesigned to ensure comprehensive patient data collection. The forms were used by the adult cardiologists for a year, but the completeness of medical documentation has not yet been examined. This study evaluated the completeness of the re-designed first-visit SEFs, where completeness was defined as the number of items recorded in the SEFs among all those that should have been recorded.

**Methods.** The instrument was developed based on the content of the first-visit SEF. The items selected for evaluation of completeness of medical records were assigned the same weight. Data on patient diagnosis and primary cardiologist were collected for further data analysis. The sample size of the study was set for 95% standard agreement and 10% least difference to detect. Sixty-one first-visit SEFs of patients sequentially admitted to the ACC during May-June were reviewed.

**Results.** Prior to data analysis recoding of variables was done to calculate total score of completeness of medical documentation. Completeness of items filled by nurses was higher than those by physicians. The most complete recording was identified for physical examination, while the poorest for patient complaints. The actual mean score was significantly lower than the hypothesized one for all domains, except for comorbid conditions, where the actual score was higher than the hypothesized one.

The lowest completeness of records in the SEFs made by nurses was identified for resident name, body mass index (BMI), smoking status in the past, and high fat consumption. Other documentation by nurses had either good or excellent completeness. Almost all items of patient complaints domain, hypercholesterolemia among items of medical history, and medications used at the time of the 1<sup>st</sup> visit had the poorest completeness. Data on other diseases/comorbid conditions a patient had and physical examination results, findings of EKG and EChO examination had good or excellent completeness. However, assignment and /or performance of other tests was impossible to identify from the SEFs due to very poor recording. The first-visit SEFs did not contain complete information on abnormal findings indicated during patient examination.

**Conclusions and recommendation.** The study revealed that periodical evaluation of medical records documentation is essential to ensure complete and accurate collection of patient-level data. The first-visit SEFs can be used as a source of comprehensive patient information if the following recommendations are implemented:

- Eliminate the item on climax, hormone replacement therapy, and the structured items for recording patient complaints from the SEFs.
- Provide nurses with calculators, so that they can compute patients' BMIs, or create a variable in the outpatient database that will automatically calculate patients' BMIs.
- Add "not tested" response for recording hypercholesterolemia to differentiate positive and negative test results from missing data.
- Attach results of additional tests performed/assigned to a patient to his/her ambulatory folder or document the results.
- Conduct training among adult cardiologists and nurses on completion of first-visit SEFs, emphasizing the utmost importance of recording the risk factors, prescribed treatment, and necessity of prescribing the next follow-up visit, if needed.
- Requesting that the cardiologist responsible for a patient signs his/her SEF, which may make positive influence on the accuracy and completeness of medical records.
- Assign and train a person responsible for reviewing the first-visit SEFs daily and returning those to cardiologists for completion, if needed.

## 1. Background

Record Review 2 Project (RR-2P) was conducted to evaluate reliability and validity of patient specific information collected in the Adult Cardiology Clinic at NMMC in 2001. Based on the study findings, the first-visit structured encounter forms (SEFs) at the Adult Cardiology Clinic (ACC) were redesigned to ensure comprehensive patient data collection. The first-visit SEFs included additional administrative data, such as patient postal index, type of visit (emergency or planned), referring institution and/or physician, and patient identification number that is planned to be introduced at NMMC in future. Information on risk factors of post-operative complications and perioperative mortality were added in a structured way to have comprehensive patient-level data to monitor health care outcomes at NMMC over time and to compare selected indicators amongst similar health care organizations. It included also information on patient lifestyle behavior, such as smoking status, diet, routine physical activity, family predisposition to ischemic heart disease (IHD), sudden death, hypertension, and other cardiac diseases.

The RR-2P survey also indicated significant under-recording of negative responses for patient complaints, medical history, current treatment, and comorbid conditions, which did not allow differentiating negative responses from missing ones. Considering such a recording pattern, the first-visit SEFs were redesigned to document both positive and negative responses, medications that patients were receiving at the time of the first visit, as well as detailed data on comorbid conditions, disease and surgical interventions patient had in the past. Further, some components of physical examination, ECG, and EChO, namely, palpation of peripheral arteries, assessment of peripheral edema, valve stenosis and insufficiency were structured to ensure better recording of patient assessment data. Finally, more details on additional tests prescribed and/or assigned to patients were added into SEFs to collect complete information and facilitate monitoring of health care quality provided at NMMC.

The first-visit SEFs were redesigned based on the Society of Thoracic Surgeons database for adults. This was done in close collaboration with cardiologists at the ACC to address their needs and ensure collection of detailed patient-level data according to established standards. The redesigned first-visit SEFs were pre-tested during one-month period. Based on the pre-test results small changes were made in the forms. Nurses were provided with definitions of different levels of diet, physical activity, alcohol consumption to ensure data collection in accordance with accepted standards.

Quality improvement activities significantly rely on medical records, so that their adequacy and completeness should be evaluated periodically. Redesigned first-visit SEFs were in use at the ACC for more than one year, while no attempts were made to evaluate the completeness of medical records post-intervention.

## 2. Methods

An instrument was developed based on the content of the first-visit SEF and was limited to a 104-item questionnaire to verify the completeness of physicians' and nurses' recording. The selected items were relevant to quality assurance and research purposes and the same weight was assigned to each of them. The completeness was defined as a number of items recorded in the SEFs among all those that should had been recorded.

Most items in the instrument were close-ended with yes and no responses meaning that the information is recorded or not, respectively. The pre-test of the instrument indicated that several items describing abnormal results of physical examination and other tests, required also not applicable (N/A) response. If normal findings were indicated in patients, the item “If abnormal, describe” was irrelevant and left blank, so that in these instances complete recording should be considered.

The study protocol assumed that the completeness of medical documentation may depend on cardiologists and patient diagnosis. Diagnoses were collapsed into the following groups: IHD, Valve Heart Disease (VHD), Hypertension, Combined diagnosis, and Others.

The sample size of the study was determined using one-sample proportion formula in the STATA statistical software (version 7.0). The standard agreement was 0.95 with 10% the least desirable difference to detect. With 80% power and alpha error of 0.05, the sample size was calculated as 53. This size was increased to 61, considering possible problems that might naturally rise during study implementation.

The first-visit SEFs were retrieved from the archive of the adult outpatient clinic. The last 60 records of patient admitted to the ambulatory during June-May were selected. It was believed that such a selection was not biased in terms of completeness of medical records, though the representation of each provider’s record may not be equal. However, the survey aimed to detect completeness of medical forms in general rather than pinpoint recording differences among physicians.

The study was conducted in June-July, 2003 by the team members of the American University of Armenia – Nork Marash Medical Center Project and NMMC staff, a member of the Medical Board and Quality Assurance Committee at the hospital.

### **3. Results**

#### **3.1. Completeness of medical records for each domain**

Data were entered and analyzed in SPSS statistical software. Prior to conducting analysis data were cleaned to ensure accuracy of entered information.

Items were recoded and collapsed into domains to compute total scores for nurse and physician recording. Responses “no” having the value of 2 were recoded into a new variable with 0 value, whereas responses “yes” were assigned the value of 1, so that the total score for each domain could be calculated by summing all eligible variables. Items included in each domain are described in Appendix 2. The following scale was used to determine the level of completeness:  $\leq 40\%$  - very poor, 41-60 – poor, 61-80 good, and  $\geq 81$  – excellent. This scale was used to determine the strength of percent agreement between observations of patient-provider encounters and documentation of patient data in medical records in the study of Evaluation of Medical Records Documentation in the Adult Cardiology Clinic at NMMC, 2001 [1].

Completeness of items filled by nurses was higher than that made by physicians (Table 1). The most complete recording across domains was identified for physical examination, while the poorest one was indicated for patient complaints.

One sample t-test was performed to determine the difference between mean score and hypothesized value for each domain that corresponds to 85% completeness of medical documentation. Actual mean score was significantly lower than the hypothesized one for all domains, except for comorbid conditions, where the actual score was higher than the hypothesized (Table 1). There was no difference in recording pattern among cardiologists and across patient diagnoses.

**Table 1. Mean score for nurse and physician recording by domains**

Recording of each domain	Percentage of complet.*	Compleat. level	Mean ( $\pm$ sd)	Hypoth. mean	Sig. level	95% confidence interval	
						Lower bound	Upper bound
Nurse recordings	66.3	Good	13.92 ( $\pm$ 2.74)	17.85	.000	3.23	4.63
Physician recordings	58.0	Poor	36.5 ( $\pm$ 9.96)	53.55	.000	14.44	19.54
Patient complaints	28.2	Very poor	2.54 ( $\pm$ 2.92)	7.65	.000	4.36	5.86
Comorbid conditions	68.9	Good	11.72 ( $\pm$ 4.10)	14.45	.000	2.88	4.28
Physical examination	90.6	Excellent	10.87 ( $\pm$ 2.74)	10.2	.000	-2.57	.47
Test performed/assigned	50.0	Good	9.0 ( $\pm$ 3.61)	15.3	.000	5.38	7.22
<b>Total</b>	<b>60.1</b>	<b>Good</b>	<b>50.48 (11.07)</b>	<b>71.4</b>	<b>.000</b>	<b>18.09</b>	<b>23.76</b>

\* Completeness was calculated from the total # of items in each domain

### 3.2. Recording of general information

The lowest completeness of SEFs was identified for resident name, heart failure class, comorbid conditions, follow-up plan, body mass index (BMI), and hormone replacement therapy items (Table 2). Resident name was rarely recorded in the first-visit SEF. Cardiology resident assess patient status independently and report the results of a patient's examination to his/her primary cardiologist mostly if the patient needs invasive cardiac procedure or surgery. Contrary to a cardiologist, particular resident cannot be assigned to the patient. The resident's name admitting the patient can be recorded in the first and/or follow-up visit SEF every time the patient is seen in the clinic.

BMI, heart failure class, and some comorbid conditions, such as diabetes mellitus, renal problems, and others are important risk factors predicting perioperative mortality [2]. Though these data are gathered and recorded in more details in medical history section, it is not recorded under the diagnosis section, which is not computerized and can easily retrieved if needed.

None of records identified the follow-up plan of patients, so that looking at these data it is impossible to identify whether a patient received cardiac procedure or s/he was prescribed medical treatment only. However, having these data recorded in the first-visit SEFs and computerized, it would be easy to select all patients who received cardiac surgery, invasive procedure, referred to the Arrhythmology Clinic and other follow-up groups.

Smoking status, routine physical activity, alcohol consumption, and high fat diet are major risk factors of coronary artery diseases. Although this information is reported by patients, it

can be used as baseline data for further research activities. It may help cardiologists to identify those aspects of lifestyle/behavior that should be carefully looked at and stressed during patient education/counseling activities. However, poor recording pattern was indicated for smoking status in the past and high fat diet.

Index mail is essential for Patient Follow-up Center, which is planned to establish at NMMC to monitor health care outcomes over time. The regular mail service requires recording of the post index. However, it was recorded in less than half of the cases.

Climax and hormone replacement therapy are included in the Society of Thoracic Surgeons adult database as obligatory items to be recorded. Considering that patients coming at NMMC rarely receive hormone replacement therapy these items could be omitted. Hormone replacement therapy can be recorded under the item “medication receiving at the time of the first visit”, while climax can be recorded in medical history section.

**Table 2. Completeness of recording general information in the first-visit SEF\***

Item	% recorded	Completeness Value	Item	% recorded	Completeness Value
Cardiologist name	98.4	Excellent	Patient height	80.3	Good
Resident name	1.7	Very poor	Body mass index	3.3	Very poor
Patient date of birth	100	Excellent	Current smoking status	68.3	Good
Patient gender	100	Excellent	Smoking status in the past	20.4	Very poor
Type of the first visit	77.0	Good	Routine physical activity	88.5	Excellent
Residency address	100	Excellent	Alcohol consumption	86.9	Excellent
Mail index	41.0	Poor	Cholesterol/fat consumption	18.0	Very poor
Home telephone number	96.7	Excellent	Drug allergy	90.2	Excellent
Primary diagnosis	96.7	Excellent	Other allergy	88.5	Excellent
Heart failure class	10.0	Very poor	Family predisposition	34.4	Very poor
Comorbid conditions	9.8	Very poor	Climax	21.3	Very poor
Follow-up plan	0	Very poor	Receiving hormone replacement therapy	8.2	Very poor
Patient weight	78.7	Good			

\*The percentages are calculated excluding missing values

### 3.3. Patient complaints and medical history

The first-visit SEF for adults was redesigned in a way to include recording of negative responses and/or history of having a certain complaint in the past while a space was provided for additional comments. In reality completeness of records on patient complaints was very poor (Table 3). Cardiologists record patient complaints by hand in a space allocated for additional comments. Medications used at the time of the first visit are recorded in less than 50% of reviewed SEFs, whereas this information reflects and may provide peer review committees with invaluable data on continuity and quality of care delivered at NMMC.

Recording of comorbid conditions was good, except for hypercholesterolemia (42.6%). It should be emphasized that high cholesterol level, previous cardiac procedures and surgeries are major risk factors of perioperative mortality of cardiac surgery and, consequently, should be carefully recorded. Completeness of information on diseases and surgeries other than cardiac interventions in the past may facilitate monitoring of health care outcomes and comparison of selected indicators at NMMC over time and within similar health organizations.

**Table 3. Recording of patient complaints and medical history \***

Item	% recorded	Completeness value	Item	% recorded	Completeness value
Chest pain	31.1	Very poor	Peripheral vascular disease	85.2	Excellent
Chest pain in the past/currently	18.0	Very poor	Rheumatic fever	85.2	Excellent
Shortness of breath	35.0	Very poor	Infectious endocarditis	85.2	Excellent
Item	% recorded	Completeness value	Item	% recorded	Completeness value
Shortness of breath in the past/currently	23.0	Very poor	Hypercholesterolemia	42.6	Poor
Arrhythmia	32.8	Very poor	Hypertension	75.4	Good
Arrhythmia in the past/currently	23.0	Very poor	Urinary-genital tract diseases	77.0	Good
Edema	31.1	Very poor	Renal diseases	78.7	Good
Edema in the past/currently	14.8	Very poor	Gastrointestinal diseases	80.3	Good
Medications used at the time of the 1 <sup>st</sup> visit	45.9	Poor	Diseases in the past	73.8	Good
Diabetes mellitus	93.4	Excellent	Invasive cardiac procedures in the past	65.6	Good
Cerebrovascular accident	86.9	Excellent	Cardiac surgeries in the past	65.6	Good
Obstructive pulmonary disease	85.0	Excellent	Other surgeries in the past	73.8	Good

*\*The percentages are calculated excluding missing values*

### 3.4. Physical examination, EKG, EChO and additional tests results

Most components of physical examination were recorded nearly completely with an exception of lung auscultation, which was recorded in 77% of cases (Table 4). Less complete recording was revealed for ECG and EChO examinations. Though the degree of valve insufficiency has a subjective component of physician's evaluation, this classification is recommended by the Society of Thoracic Surgeons and may facilitate fair comparison of health care outcomes at NMMC and within similar health institutions. Much poor recording was detected for additional tests, such as X-ray, treadmill, MRI, holter, coronary artery angiography, and consultations of a specialist other than cardiologist. X-ray examination is assigned to almost all patients planning to undergo cardiac surgery. X-ray films are kept separately from patient ambulatory folders and are placed in the hospital archive in a year. The results of other additional tests are given to patients, thus blank item does not allow

identifying whether this test was assigned to a patient or not. This information is used to monitor management of patients with specific conditions and compliance of a hospital to the established clinical guidelines. It should be noted prescription of medications was recorded only in 60.7% creating difficulties in retrospective data collection to monitor health care outcomes. Poor recording of prescribed treatment is unacceptable for a health care organization striving to provide high quality care and receive international accreditation.

Unrecorded date of the next visit hinders calculation of patients lost to follow-up. In certain cases, prescription of the next visit is unnecessary, e.g. in case of normal study. Besides, in certain instances cardiologists instruct patients to come at NMMC for follow-up visit within particular time without giving precise date and time. It should be noted that prescription of specific date increases patients' compliance to treatment instructions and lessens lost to follow-up rate. Scheduling appointments, when possible, may decrease the number of patients arriving in the clinic without appointments, thus, leading to better organization of work in the ACC.

**Table 4. Recording of physical examination and other tests results\***

Item	% Recorded	Completeness level	Item	% Recorded	Completeness level
Systolic blood pressure	93.4	Excellent	Tricuspid stenosis	88.5	Excellent
Diastolic blood pressure	90.0	Excellent	Pulmonary artery stenosis	88.5	Excellent
Lung auscultation	77.0	Good	Mitral insufficiency	72.1	Good
Heart sounds	87.9	Excellent	Aortic insufficiency	70.5	Good
Systolic murmur	93.3	Excellent	Tricuspid insufficiency	70.5	Good
Diastolic murmur	93.4	Excellent	Pulmonary artery insufficiency	70.5	Good
Carotid artery auscultation	90.2	Excellent	X-ray exam	13.1	Very poor
Abdominal palpation	93.4	Excellent	Results of X-ray exam	7.1	Very poor
Liver palpation	91.8	Excellent	Coronary artery angiography	40.0	Very poor
Right radial pulse	95.1	Excellent	Cardiac catheterization	13.3	Very poor
Left radial pulse	95.1	Excellent	Treadmill test	24.6	Very poor
Right pedal pulse	95.1	Excellent	Holter test	16.4	Very poor
Left pedal pulse	95.1	Excellent	Computer tomography	4.9	Very poor
Peripheral edema	80.3	Good	MRI exam	4.9	Very poor
Type of heart rhythm	80.3	Good	Consultation of a specialist other than cardiologist	9.8	Very poor
Frequency of heart rhythm	75.4	Good	Prescribed medications	60.7	Very poor
Mitral stenosis	85.2	Excellent	Date of the next visit	21.3	Very poor
Aortic stenosis	88.5	Excellent			

\*The percentages are calculated excluding missing values

If abnormal findings are found in patients, physicians are requested to describe them in handwriting in the first-visit SEFs. Not applicable response reflects the percentage of cases

when findings were within the norm. Data provided in Table 5 shows that recording of abnormal findings is incomplete.

**Table 5. Documentation of abnormal findings of patient’s physical exam**

<b>Abnormal findings</b>	<b>% recorded</b>	<b>% not recorded</b>	<b>N/A*</b>
Lung auscultation	1.6	39.3	59.0
Heart sounds	4.9	34.4	60.7
Systolic murmur	6.6	29.5	63.9
Diastolic murmur	1.6	32.8	65.6
Carotid artery auscultation	1.6	36.1	62.3
Abdominal palpation	0	32.8	67.2
Liver palpation	0	34.4	65.6
Degree of peripheral edema	6.6	37.7	55.7

\*N/A – not applicable

## 4. Recommendations

Based on the study findings the following recommendations for redesigning the first-visit SEFs of the ACC were made:

1. Eliminate climax and hormone replacement therapy from the SEFs. The first item can be documented in the space provided for recording patient’s anamnesis, while the second one can be recorded under the medications used at the first visit.
2. Provide nurses with calculators, so that they can compute patients’ BMIs. Another alternative is to add patients’ weight and height variables into the adult ambulatory database and to create an item that will automatically calculate patients’ BMI while entering afore-mentioned data.
3. Conduct training of nurses and physicians on completing the first-visit SEFs emphasizing the importance of collected information for monitoring patient outcomes, quality improvement, research, and other purposes.
4. Add “not tested” response for recording hypercholesterolemia to differentiate positive and negative test results from missing data.
5. Eliminate structured items for recording patient complaints and discuss with cardiologists possible ways to improve recording pattern.
6. Attach results of additional tests performed/assigned to a patient to his/her ambulatory folder or document their results.
7. Conduct training among adult cardiologists on completion of the first-visit SEFs, emphasizing the utmost importance of recording the risk factors, prescribed treatment, and necessity of prescribing the next follow-up visit, if needed.
8. Requesting that a cardiologist responsible for a patient signs his/her SEFs and by this mean confirming the accuracy and completeness of medical records.
9. Assign and train a person responsible for reviewing the first-visit SEFs daily and return to cardiologist for completion, if needed.
10. Publicize the results of this investigation among NMMC clinical staff and inform them that this evaluation will be repeated after defined time-period.

## 5. References

1. Oksuzyan A, Demirchyan A, Thompson ME. The Evaluation of Medical Records Documentation and Surgical Summary Database at Nork Marash Medical Center. American University of Armenia and Nork Marash Medical Center, Yerevan, Armenia, October 2001.
2. American College of Cardiology/American Heart Association. Guidelines on Coronary Artery Bypass Graft Surgery. JACC, October 1999; vol. 34 (4), p.1262-1347.



Item	Recording*	Item	Recording*
<b>BP:</b> systolic		<b>ECG:</b>	
diastolic		Rhythm	
Lung auscultation		Frequency	
If abnormal, description		Description	
Heart sounds		<b>EChO:</b>	
If abnormal, description		Mitral stenosis	
Systolic murmur		Aortic stenosis	
If heard, maximal area		Tricuspid stenosis	
Diastolic murmur		Pulmonary artery stenosis	
If heard, maximal area		Mitral insufficiency	
Carotid artery auscultation		Aortic insufficiency	
If abnormal, description		Tricuspid insufficiency	
Abdominal palpation		Pulmonary artery insufficiency	
If abnormal, description		X-ray examination	
Liver palpation		If performed, description	
If abnormal, description		Coronarography	
Peripheral arteries palpation:		Catheterization	
Right radial artery		Treadmill test	
Left radial artery		Holter	
Right pedal artery		Computer tomography (CT)	
Left pedal artery		MRI	
Peripheral edema		Consultations	
If found, description		Medications prescribed	
		Date of the next visit	

\* 1- recorded, 2- not recorded, 3 – not applicable

## Appendix 2. Items included in each domain

<b>Nursing recording</b>	
Cardiologist	Smoking status: current smoker
Resident	previous smoker
Date of birth/Age	Physical activity
Gender	Alcohol consumption
Type of the first visit	High fat diet
Address	Drug allergy
Postal index	Other allergies
Patient telephone number	Blood pressure: systolic
Weight	diastolic
Height	ECG: Frequency
Body mass index	
<b>Patient complaints*</b>	
Chest pain, Currently/in the past	Arrhythmia Currently/in the past
Shortness of breath Currently/in the past	Edema Currently/in the past
	Medications used at the time of the first visit
<b>Physical examination*</b>	
Lung auscultation	Peripheral arteries palpation:
Heart sounds	Right radial artery
Systolic murmur	Left radial artery
Diastolic murmur	Right pedal artery
Carotid artery auscultation	Left pedal artery
Abdominal palpation	Peripheral edema
Liver palpation	
<b>Tests performed/assigned*</b>	
ECG Rhythm	Pulmonary artery insufficiency
ECG Description	X-ray examination
Mitral stenosis	Coronarography
Aortic stenosis	Catheterization
Tricuspid stenosis	Treadmill test
Pulmonary artery stenosis	Holter
Mitral insufficiency	Computer tomography (CT)
Aortic insufficiency	MRI
Tricuspid insufficiency	Consultations
<b>Comorbid conditions and diseases in the past</b>	
Diabetes mellitus	Hypertension
Cerebrovascular accident	Urinary tract diseases
Obstructive pulmonary disease	Renal failure
Peripheral vascular disease	Gastrointestinal diseases
Rheumatic fever	Other diseases in the past
Infectious endocarditis	Invasive cardiac procedures in the past
Hypercholesterolemia	Cardiac surgery in the past
	Other surgeries in the past

\* Items included in Patient complaints, Physical Examinations, Tests assigned/performed plus Diagnosis, Patient follow-up plan, Comorbid conditions, Heart failure class, prescribed medications, date of the next visit compose Physician recording domain.