

Quality & Safety at Hadassah - Progress Report

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Executive summary

In a fourth year of activity, a variety of projects for clinical quality & safety are being conducted at both Hadassah hospitals. Some areas show opportunities for, or demonstration of, improvement. These include: patient's empowerment to improve oral anticoagulation; peri-operative antibiotic prophylaxis; safety of medications storage in wards; quality of communication between hospital and family physicians; reduction of medication and surgical errors; improved glucose control for patients with diabetes; respiratory support in patients outside intensive care units; patient's involvement in urinary tract infection; cardiac rehabilitation for coronary disease; correct estimation of fetal weight in pregnancy; palliative care; team hand-washing using alcohol gel; infections in surgical wards and projects of Hadassah for promotion of healthcare quality in the community. Several national projects suggest fair or superior performance at Hadassah in trauma, neonatal care and intensive care. Institution-wide challenges for the near future include: reduction of hospital-acquired infections and comprehensive electronic support for quality & safety. Other activities consist of workshops, presentations and publications at national and international platforms, including 36 abstracts presented at the 2005 meeting of the Israeli Society for Quality in Medicine.

In conclusion, diverse projects attempt to make healthcare at Hadassah more patient-centered, more evidence-based and more system-minded. Increasing accountability by department heads for quality and safety may be a key to further successes.

The Center for Clinical Quality and Safety is a small team coaching students from the Faculty of Medicine on projects in quality. The Committee for Quality & Safety, oversees a variety of projects on patient's safety and satisfaction.

Recently completed projects

1) Patient's empowerment (self-monitoring and self-management) improves the effectiveness and the safety of oral anticoagulation.

Project participants: Dr. Hanan Goldberg, Ms. Yochi Ben David, Dr. Uzi Izhar, Ms. Lois Gordon, Dr. Tuvia Baevsky, Prof. Michael Burzstyn and Prof. Mayer Brezis

Background: Oral anticoagulation (such as with warfarin), frequently initiated in hospital for cardiovascular disorders associated with clots, is effective and safe as long as the INR (a measure of coagulation) is kept within target by optimal dosing of medication. Deviations from this target, which increase risk for bleeding or thrombosis, are unfortunately frequent: only one third of patients are in target INR at any given time. Studies have shown that training and empowerment of patients, with or without a home INR monitoring device, contribute greatly to decreased INR deviations and complications of therapy. These methods, called self-monitoring and self-management, have not yet been applied and tested in Israel.

Methods: This project was performed as a randomized controlled trial, with control and intervention groups for patients initiated on warfarin therapy. The intervention comprised of structured training on INR control. Each patient received a kit which included a booklet on warfarin in different languages (Hebrew, English, Russian or Arabic), a special ruler and a simple software for helping calculate optimal drug dosage.

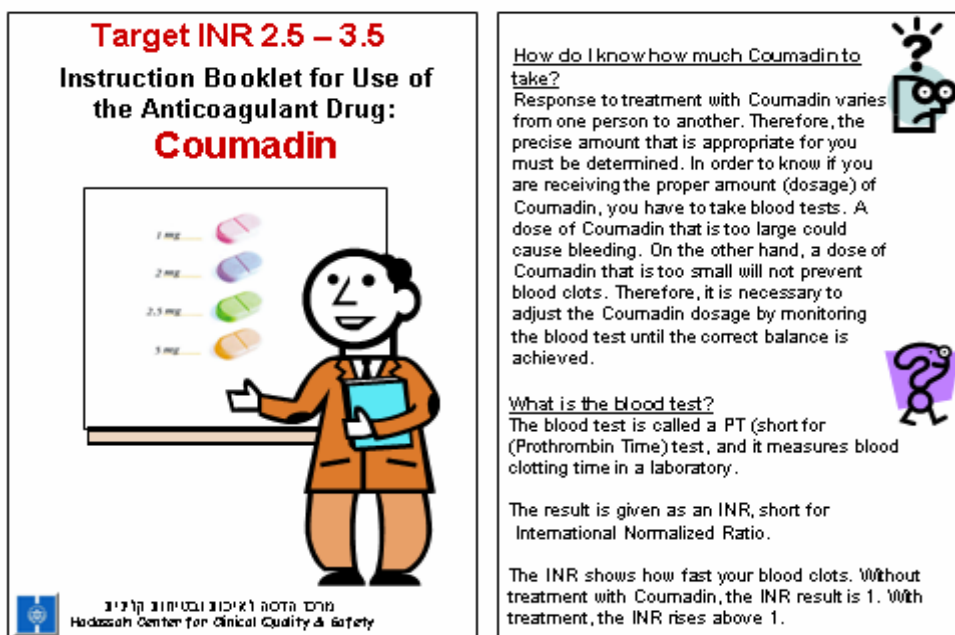


Figure 1: Pages 1 & 4 from the Instruction Booklet (English Version)



Figure 2: Specially designed ruler to help patient find correct drug dosage

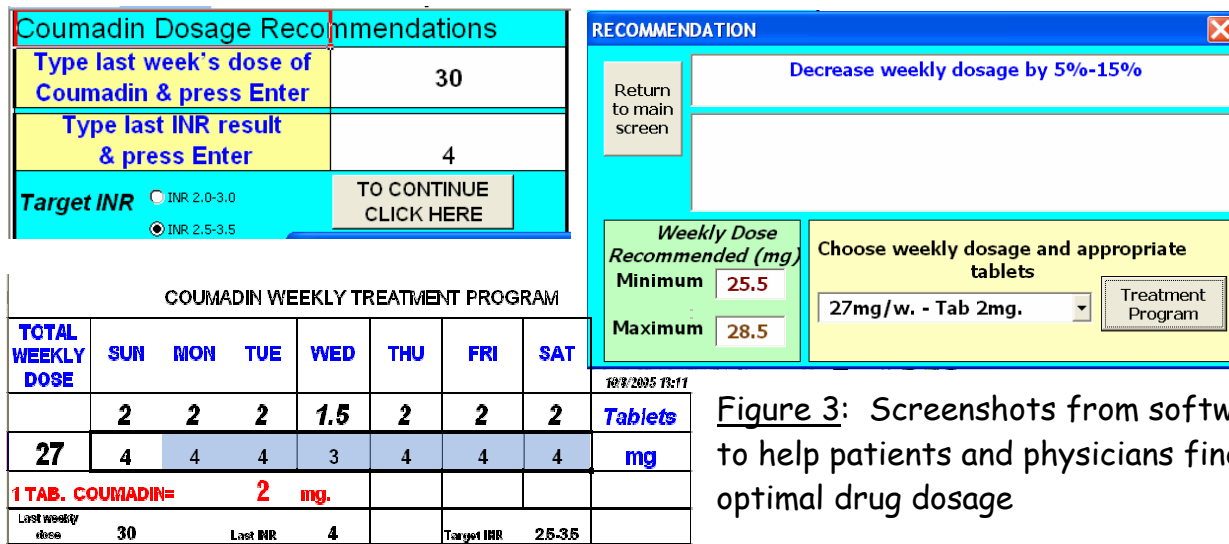


Figure 3: Screenshots from software to help patients and physicians find optimal drug dosage

The patient's family physician received a similar kit, including current literature on patient self-management and self-monitoring. Half of patients in the intervention group were randomly selected to also receive a self-monitoring device (Coagucheck - from DYN Diagnostics). The controls included patients from various departments (Cardiothoracic Surgery, Vascular Surgery, Internal Medicine and Emergency department) initiated on warfarin before or during the intervention (historical or contemporary controls). The intervention was focused in Cardiothoracic Surgery. During a 3 months follow-up period, we collected for each patient, the number of INR tests, the percentage of results within target INR, complications, knowledge and satisfaction.

Results: The results are summarized in Table 1 (next page). In controls, 40% (or less) of the results were within target INR. On the other hand, in the

intervention groups, nearly 60% of results were within target INR, a highly significant difference.

Table 1: INR targeting, patient’s knowledge and satisfaction in control and intervention groups

	Control Groups		Intervention Groups	
	Historical (N=32)	Contemporary (N=26)	Without device (N=13)	With device (N=14)
% of results within target INR	40%	36%	58% *	61% *
Patient’s knowledge (% correct answers)	-	60%	83% *	87% *
Patient’s satisfaction (on 1-5 scale; 1 highest, 5 lowest)	-	2.53	2.32	1.55*

* p < 0.001 (ANOVA & Scheffe’s test)

Patient’s knowledge was significantly higher in the intervention groups in comparison to controls: all patients knew their targets (as opposed to 40% in controls); all patients knew the main complications from anticoagulation (as opposed to only few in controls); nearly 90% of patients were very satisfied from the instructions kit to promote self-management and empowerment. Patient’s satisfaction was highest in the group with the home monitoring device.

Conclusions: Training and empowerment of patients to self-management and to self-monitoring markedly improve the effectiveness and safety of oral anticoagulation therapy.

These results are very similar to those recently reported abroad.¹ Experts conclude that a patient-professional partnership in the form of self-management of anticoagulation can reduce the risk for thromboembolic disorders, leading to better reliability, better quality, and reduced risks: it is a valuable model for the management of anticoagulation which requires a shift in focus and resources by health care systems and providers.²

Future plans: We are currently designing the dissemination of this intervention to other departments, with large-scale publication of the kit and “training of trainers” in different wards.

¹ Menendez-Jandula B, Souto JC, Oliver A, et al. Comparing Self-Management of Oral Anticoagulant Therapy with Clinic Management: A Randomized Trial. *Ann Intern Med.* 2005;142(1):1-10.

² Beyth RJ. Patient Self-Management of Anticoagulation: An Idea Whose Time Has Come. *Ann Intern Med.* 2005;142(1):73-74.

2) Surveillance of peri-operative antibiotic prophylaxis.

Project participants: Dr. Yoni Yossef, Dr. Alon Moses and Prof. Mayer Brezis

Background: Surgical site infections (SSI's) are the most common nosocomial (i.e., hospital acquired) infections in surgical departments. SSI's are associated with morbidity, prolonged hospitalization and antibiotic treatment, readmission, re-operation, mortality and increased costs. In many surgical procedures, established guidelines exist for preventive usage of antibiotics. Usually, one dose of an antibiotic aimed against the common bacteria at the site of surgery, should be given shortly before surgery. Timing is crucial to yield therapeutic levels of antibiotic in blood and tissues at start of surgery and incorrect timing increases SSI rates. Studies show that patients often receive prophylactic antibiotics incorrectly. In this project, we surveyed the use of antibiotic prophylaxis at Hadassah.

Methods: A total of 246 consecutive patients admitted for elective surgery were reviewed. The operations included: hernia repair (67), laparoscopic cholecystectomy (32), breast surgery (71), hemicolectomy (30) and transabdominal hysterectomy (46). Every case was evaluated for appropriateness of prophylactic antibiotics by the following criteria: 1. Antibiotic prophylaxis is indicated and spectrum appropriate for that specific operation. 2. Prophylaxis was given before surgery and within 2 hours prior to skin incision. 3. One dose of antibiotics was given or, if repeated, for no more than 24 hours. Rates of inappropriate use of antibiotics were compared to the literature. Associations between inappropriateness and potentially predicting factors were examined.

Results: Of 246 patients, 84% (206 patients) received prophylactic antibiotics. In 52% of treated patients (107/206) there was an indication for prophylaxis, in 26% indication was optional and in 22% of patients treatment was against evidence. In only 65% of cases, timing of administration was documented in the chart. Among these, timing was appropriate in 58%, too early in 15% and too late in 27% (5% received prophylaxis only *after* surgery had ended). In total, 42% of patients received treatment on inappropriate timing. 82% of patients received prophylaxis in the operating room, 12% in the ward (before transfer to operating room) and 6% in both places (often receiving medication twice). Site of antibiotic administration was correlated with appropriate timing: when anesthesiologists gave it, timing was appropriate in 72% of cases, vs. only 4% when treatment was given in the ward ($p < 0.0001$). Spectrum of antibiotics was appropriate in 92% of cases. Only a third of patients received one dose: nearly half were treated longer than recommended. Senior surgeons were more likely than residents to use prophylaxis longer than required (69% vs 47% respectively,

p=0.007). In total, 64% of patients given antibiotics, were treated inappropriately (95% confidence intervals: 57%-70%).

Discussion and conclusion: Guidelines for peri-operative prophylactic antibiotics are only partially implemented. The results are comparable to those reported in US hospitals, before an intervention:³ as shown in Table 2 (below) and demonstrate clear room for improvement at Hadassah.

Table 2: Performance for peri-operative antibiotic prophylaxis: percent of correct administration is shown in a group of US hospitals at 4 consecutive observations (before and after an improvement intervention). Mean performance at Hadassah is superimposed on originally published table.

Changes in surgical infection prevention processes, by quarter, National Surgical Infection Prevention Collaborative

Process measure	Mean performance at Hadassah	Median performance, by quarter				Paired difference between 1st and 4th quarters*	25th–75th percentile†	P‡
		1st	2nd	3rd	4th			
Antibiotic timing within 1 h	58%	72	82	89	92	15	7.3–24	<.0001
Appropriate antibiotic selection	92%	90	94	95	95	3.4	–1.7–10	.02
Discontinuation of antibiotic within 24 h	47%	67	69	74	85	7.3	0.99–15	<.0001

The results have been discussed with surgical teams who have agreed on principles for improvement: local protocols for correct administration of prophylactic antibiotics should be developed; antibiotic prophylaxis should be given in operating room by anesthesiologists; timing should be documented and duration of treatment limited to 24 hours - preferably one single dose prior to surgical incision. Electronic monitoring may be a preferred method of surveillance for appropriate surgical infection prophylaxis.

Future plans: improving prophylaxis should be part of a larger systematic effort to reduce hospital acquired infection (see below).

3) Safety of medications storage in wards

Project participants: Ms. Nurit Porat, RN, Mgr. Hannah Rosenbaum, Ms. Pnina Sharon, Mgr. Lenna Rothfeld, Prof. Yoel Donchin, Mgr. Rivkah Shouval - the subcommittee on Quality and Safety in Medications.

Background: Considerable information has emerged from reports and discussion of errors or near-misses at the subcommittee on Quality and Safety for Medications. Adverse events could often be traced to deviation from simple guidelines regarding the proper storage and tagging of medications or dangerous solutions (such as KCL or toxic cleaning solutions).

³ Dellinger EP, Hausmann SM, Bratzler DW, et al. Hospitals collaborate to decrease surgical site infections. The American Journal of Surgery. 2005;190(1):9-15.

Methods: During the year of 2004, a survey of medication storage safety was performed in 22 wards at Mt. Scopus and 45 wards in Ein Kerem Hadassah hospitals. The survey included a checklist of over 50 items regarding safe storage and clear labeling of medications and solutions, including presence of outdated or split pills and criteria for safer and cleaner work environment during the preparation and distribution of medications.

Results: In 25% of Ein Kerem wards, some of the medicines were outdated. In nearly half of Ein Kerem wards and in less than 10% at Mt Scopus, different dosage pills of identical medicine or different medications were found in same drawer box. In nearly 20% of wards, split (poorly identifiable) pills were found. In nearly 10% of wards, solutions or creams for external usage were stored together with medications for internal use (oral or IV). Medications stored in refrigerators were often poorly labeled or next to foods or blood specimens. Although not an immediate risk to patients, efforts to improve are desirable. In 30% of Ein Kerem wards and none at Mt Scopus, potassium ampoules were found despite lack of authorization of these wards to store this dangerous medication. Similarly, unsafe hypertonic solutions (such as concentrated saline and mannitol) were stored with standard intravenous fluids in nearly half of Ein Kerem wards and in less than 10% at Mt Scopus. Proper places for preparation of medications were often missing in Ein Kerem, due to ageing infrastructure. Tags for the safe labeling of different lines (intravenous, central, epidural, TPN and arterial) were present in less than half of Ein Kerem wards and in 90% at Mt Scopus. A summary grade for the different divisions at both hospitals is shown below: overall, Mt Scopus scored higher than Ein Kerem.

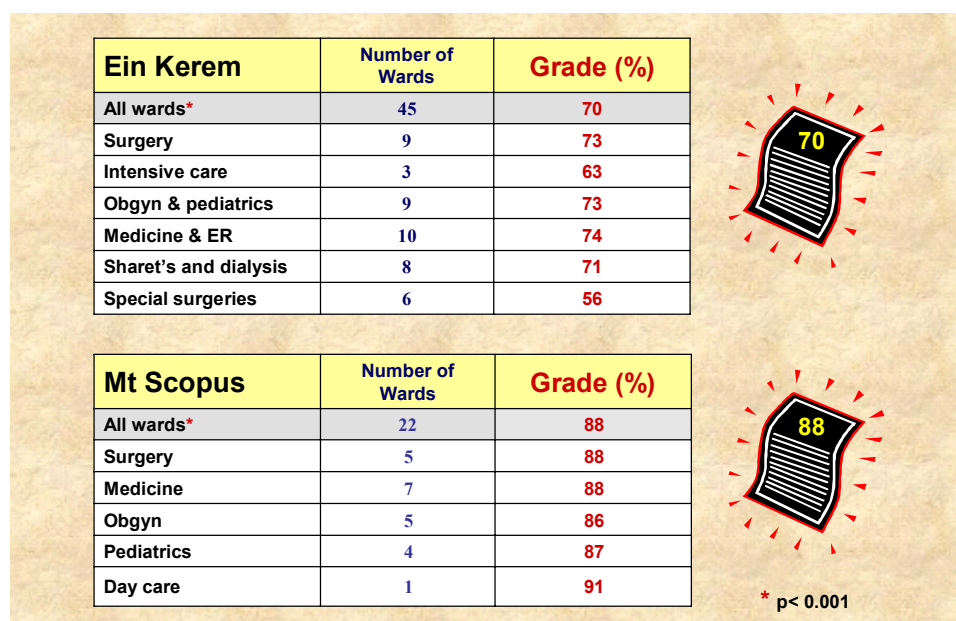


Figure 4: Summary Grades for Safety of Medications Storage - all divisions at both hospitals

Discussion and conclusion: Differential levels of implementation of simple safety measures may relate to various factors such as structure, organization, local culture and leadership. Feedback and support for correction and improvement are currently being targeted to wards with lowest scores. In the last year and based on these findings, in four wards, the area for medications storage has been completed renovated in close collaboration between the architect and the Committee for Quality & Safety in medications. At least four more wards are scheduled to undergo the same process in the next year.

4) Quality of communication between hospital and family physicians

Project participants: Dr. Michal Fewchtwanger, Dr. Amnon Lahad and Prof. Mayer Brezis

Background: Communication between hospital and family physicians is critical for efficient continuity of care, a major element in quality of healthcare and error prevention.⁴ Studies have shown that the discharge summary, main channel of information, often miss information, while verbal communication, a preferred modality, is underused. Miscommunication between hospital and family physicians derive from structural and perceptual problems, but few studies were performed in Israel. The aim of this survey was to appraise quality of communication between "Hadassah" doctors in Internal Medicine and family physicians.

Methods: The study was performed in two stages: first, face-to-face open, in depth, interviews were conducted with family physicians. In a second stage, a questionnaire was built based on these interviews and dealt with four main topics: patient characteristics, occurrence of direct communication, satisfaction with hospitalization and discharge summary. Telephone interviews were conducted with family physicians of 116 discharged patients from Internal Medicine of Hadassah Ein-Kerem.

Results: Family physicians were in general satisfied from in-hospital management, but direct communication between hospital and family doctors occurred in only 22% of cases. 82% of discharge summaries were graded as "good" or "very good". In 8.5% of the cases the family physician did not received a discharge summary. In 5 instances, summaries had no diagnoses; in 19, no ECG interpretation (9 cases were of cardiac patients). The section on

⁴ Institute of Medicine (U.S.). Committee on Quality of Health Care in America. Crossing the quality chasm : a new health system for the 21st century Washington, D.C.: National Academy Press; 2001.

recommendations missed justification in 21% of the cases and had inappropriate advices in 6 cases. A few cases had potentially fatal miscommunication: for instance, a patient had anaphylaxis during cardiac catheterization but the event was omitted in the discharge summary.

Conclusion and future plans: These observations were discussed with ward directors, who agreed on a need to improve communication between hospital and family physicians (by phone, fax or shared access to databases) upon admission and before discharge. A first step, recently implemented, is inclusion of family physician's contact details for every new patient by the admission clerk, to allow contact of community physicians by hospital teams. This study was recognized by a Best poster Award at the 2005 annual meeting of the Israeli Society for Quality in Medicine, probably because it focuses on the continuity of care as an essential aspect of quality in healthcare.⁵

5) Reduction of medication errors in a department of Medicine

Project participants: Ms. Pnina Sharon, RN, Mgr. Lenna Rothfeld and Prof. Arie Ben-Yehuda

Background: Medications errors are major threat to patient safety in hospital wards, for which awareness is a first essential step to prevention.⁶

Methods: A safety initiative by department Head, Prof. Arie Ben-Yehuda and the Head Nurse, Ms. Pnina Sharon, began in 2001 with a systematic documentation of medication errors, with special focus on discharge summaries, local intervention on processes and periodic reevaluation.

Results: The completeness of orders details (such as date, timing, clear dosage and usage of capital letters for drug names) rose from 37% adherence to guidelines in year 2001 to 59% in 2002 and 88% in 2004. Using simple interventions such as double-check of physician's orders by nurses on the night shift and feedback to physicians, a four-fold decrease of errors was documented over three years,

Conclusion & future plan: Leadership is effective in promoting a culture of safety and reducing errors and may be a critical step for

⁵ Mant A, Kehoe L, Cockayne NL, Kaye KI, Rotem WC. A quality use of medicines program for continuity of care in therapeutics from hospital to community. Med J Aust. 2002;177(1):32-4.

⁶ Kohn LT, Corrigan J, Donaldson MS. To err is human : building a safer health system Washington, D.C.: National Academy Press; 2000.

improving safety at the microsystem level.⁷ Diffusion of this example to other wards is being encouraged by presentations to department heads.

6) "Time-out" for error prevention in operating theater

Project participants: Prof. Yoel Donchin, Yael Kariv, Ido Morag and Prof. Daniel Gopher (Technion, Israeli Institute of Technology)

Background: In-hospital errors are also major threats to surgical patients and modern human engineering may reduce mistakes.

Methods: Observations were made by trained observers in the operating room. As reported in previous literature on this topic from leading centers in the world, the observers at Hadassah disclosed 4 to 5 "near-misses" during each operation in the course of nearly 40 major surgical procedures while no patient sustained any injury (a "near-miss" is an unplanned event that if not caught and corrected in time may lead to serious injury).

Intervention: A "time-out" process was introduced as a pilot project at Hadassah, as now endorsed by leading US healthcare organizations. This protocol is for surgical teams to call a "time out" before surgery begins, in order to verify the patient's identity, the procedure to be performed, and the site of the procedure. Observations were done after introduction of the "time-out" protocol.

Results: Preliminary analysis of 100 additional observations, showed a 40% reduction in the frequency of near-misses after the introduction of the "time-out" protocol.

Conclusion & future plans: If these observations are confirmed, "time-out" will be adopted as a universal protocol for major procedures.

7) Improved glucose control for hospitalized patients with diabetes

Project participants: Drs. Gil Leibowitz, Hila Elinav, Orian Shalit & Zemira Wolf.

Background: In-hospital poor diabetic control is associated with increased morbidity and mortality.⁸

⁷ Leape LL, Berwick DM. Five Years After To Err Is Human: What Have We Learned? JAMA. 2005;293(19):2384-2390.

⁸ Garber AJ, Moghissi ES, Bransome ED, Jr., et al. American College of Endocrinology position statement on inpatient diabetes and metabolic control. Endocr Pract. 2004;10(1):77-82.

Methods: Feasibility and safety of intensive insulin treatment were evaluated for diabetes in a ward of internal medicine at Ein Kerem. During an intervention period, guidelines for intensive insulin treatment were introduced to house officers and nurses, with frequent advice from endocrine specialists.

Results: Average blood glucose was significantly lower during intervention compared to pre- and post-intervention periods, 169.7 ± 37.3 vs. 211.5 ± 65.3 and 206.1 ± 63.0 mg/dl, respectively ($p=0.001$). Percentage of measurements above 250 mg/dl was considerably lower (11.1 %) during intervention vs. pre- and post-intervention periods, 27.3 % and 26.2 % respectively ($p=0.001$). There was no difference in incidence of hypoglycemia between study periods.

Conclusion & future plan: Improved glucose control by adherence to guidelines is safely achieved but maintenance requires reinforcement. Because improved glucose control is associated with reduced post-operative infections, morbidity, length-of-stay, costs and mortality in critically ill,⁹ such a program will be considered for surgical wards and intensive care units, where preliminary observations suggest suboptimal glucose control.

Additional completed projects

8) Patient involvement for better use of urine cultures in emergency room at Hadassah Mt. Scopus. An intervention was developed by the ER team to improve information transfer after a visit of patient with suspected urinary tract infection. The intervention included verbal explanations and a leaflet to have the patient understand the problem and call the laboratory to inquire about the culture result and help further antibiotic management as needed. The combined intervention was successful in increasing the percent of patients calling the lab from 29% to 65%.

9) Reliability of fetal weight in pregnancy, as estimated by residents, specialists and ultrasound. In a prospective study, 170 pregnant women between 35 and 42 weeks gestation underwent clinical and sonographic fetal weight estimations, later compared to actual birth weight. Accuracy was greatest for normal and lowest for deviations from normal weight. A systematic error of both clinical and sonographic methods is a regression to the mean: underestimating weight in large babies and overestimating weight in small babies. Accuracy did not improve with advanced clinical experience.

⁹ Ahmann A. Reduction of hospital costs and length of stay by good control of blood glucose levels. *Endocr Pract.* 2004;10 Suppl 2:53-6.

10) Adherence to anticoagulation instructions at discharge from orthopedics. A survey was performed in order to prevent cases of thrombosis sometimes occurring after successful operations. A weekly telephone survey of 100 patients disclosed excellent adherence to anticoagulation instruction for the daily injection of Clexane.

11) Analysis of end-of-life care and improvement of palliative care. A survey of 170 patients hospitalized in the departments of Medicine showed that 57% of them would be eligible to palliative care according to a palliative care screening tool recently developed at Mount Sinai School of Medicine.¹⁰ Many patients suffer from chronic conditions for which cure is not an option while symptoms such as pain, shortness of breath and anxiety could benefit from enhanced and focused palliative care. A six-weeks workshop on palliative for wards team organized by the Israeli Association for Palliative Care will take place at Hadassah on January 2006.

12) Appropriateness of referral to cardiac surgery or coronary angioplasty. To address an ongoing controversy about what is the preferred therapy for coronary disease,¹¹ we examined at Hadassah the adherence to accepted guidelines. After long discussions between cardiologists and cardiac surgeons, a set of guidelines was developed (adapted from the literature¹²) and agreed upon. Recently collected information on 323 patients fitting the research question allowed a preliminary analysis of results: 153 angioplasties and 29 operations were performed, while in 43 cases the decision was for conservative treatment (remaining patients had normal vessels and/or valvular disease). Overall rate of deviation from accepted guidelines appears to be less than 5%. Most of these cases were patients with triple vessel disease and diabetes mellitus who underwent angioplasty rather than surgery; reasons for not adhering to guidelines were generally not reported. From these data, it seems that Hadassah has as a low rate of non-adherence to accepted guidelines for revascularization, comparable to reports in New York hospitals.

13) Attempt to improve partnership of patients sent for coronary angiography. A total of 120 patients have been surveyed: most patients reported clear and detailed explanations before the procedure, but only 39% recalled having being told about risks (and most of the other wished they had received such information) and less than 10% recalled discussion of potential alternatives to the procedure. Less than half had seen the patient's booklet on the angiography, which they considered helpful. Nearly 55% believed the procedure is greatly effective for preventing future cardiac events, while

¹⁰ A Guide to Building a Hospital-Based Palliative Care Program. Diane Meier & Carol Sieger. Center to Advance Palliative Care & Mount Sinai School of Medicine, New York NY 2004.

¹¹ Califf RM. Stenting or Surgery: An Opportunity to Do it Right. J Am Coll Cardiol. 2005;46(4):589-591.

¹² Eagle KA, Guyton RA, Davidoff R, et al. ACC/AHA 2004 Guideline Update for Coronary Artery Bypass Graft Surgery: Summary Article: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery). Circulation. 2004;110(9):1168-1176.

only 15% of cardiologists believed so. Less than 20% of patients had been referred to cardiac rehabilitation and over a third thought that after the procedure, there was no longer a cardiac problem. An intervention designed to increase patient's empowerment and enhance referral to rehabilitation has been only partially successful at this stage and will need further discussion with cardiologists.

Projects in progress and new projects

14) Hand-washing by medical staff. A survey of hand-washing by physicians during routine rounds, at both Hadassah hospitals, was conducted through observation of behavior. Results show great variation in compliance between wards, from 80-96% adherence (in pediatrics & neonatal unit) to 50-80% (in internal medicine and some surgical wards) and to 30% or less (in other surgical wards, orthopedics and ER). An intervention is currently been implemented to improve compliance in wards with poor performance through dispensing of an alcohol gel. Preliminary observations are encouraging, with an increase in hand-washing from 17% to 45%, in one surgical ward.

15) Survey of outcomes and patient satisfaction from hernia repair. Hernia repair is one of the most frequent surgical procedures for adults and children, with over 400 cases per year at both Hadassah hospitals. A survey of success and complications rate as well as patient's satisfaction is being now conducted by routine auditing and interviews. Preliminary results suggest high performance, high satisfaction and very low rate of complications. The survey is expected to be completed by the end of year 2005.

16) Survey of infections in surgical wards. In the first half of year 2005 (at the initiative of Y. Dr. Mintz from surgery) a routine surveillance of all post-operative infections was set in place in Ein Kerem. Preliminary review shows that out of 574 operated patients, 54 got infections (including 22 with surgical site infection, 18 with bacteremia, 5 line sepsis, 5 with positive stools for *Clostridium difficile*, 1 pneumonia and 20 with bacteriuria). In addition, eleven cases had phlebitis at the site of the intravenous line. The data have been recently discussed with the Infection Diseases Unit. The rate of surgical site infection (3.8%) may not differ from those reported elsewhere.¹³ Yet, pending further analysis and check of methods for collecting data, a tentative conclusion is that a systematic approach is needed at both hospitals to reduce the rate of post-operative infections, as recently reported in the US.¹⁴

Future plan: Hadassah central management has recently decided to declare next year at both Hadassah hospitals, "the year for prevention of infections". Consideration will be

¹³ Wilson APR, Gibbons C, Reeves BC, et al. Surgical wound infection as a performance indicator: agreement of common definitions of wound infection in 4773 patients. *BMJ*. 2004;329(7468):720.

¹⁴ Dellinger EP, Hausmann SM, Bratzler DW, et al. Hospitals collaborate to decrease surgical site infections. *The American Journal of Surgery*. 2005;190(1):9-15.

made to a multifaceted approach at infection prevention:¹⁵ correct antibiotic prophylaxis, perioperative normothermia, glucose control, aseptic rules with improved hand-washing with alcohol gel, lines surveillance & early removal¹⁶ and periodic measurements of infection rates. For planning and implementation, we will consider a multi-disciplinary task force, including physicians and nurses from infectious diseases, surgery, anesthesiology, and endocrinology.

Community-focused Quality Projects

A number of projects have been initiated in recent years by the Clinical Center for Quality & Safety for healthcare promotion & education in the community at large.

17) Improved patient instructions at discharge after hip or forearm fractures. Because osteoporosis is highly prevalent in patients with these types of fracture, further fractures can be effectively prevented by life-style interventions (exercise and smoking cessation) and medications (bisphosphonates or vitamin D).¹⁷ A leaflet with such explanations is now being tested by Orthopedic teams.

18) Electronic reminders for preventive care in primary care clinics. A beta version software, developed by Dr. Baevski (Klalit), was tested in collaboration with our Center. The clinic with electronic reminders in use had markedly improved performance (vs. 13 other primary care clinics) for various parameters. For instance, aspirin for cardiovascular disease was used in 94% of patients (vs. 63-82% in other clinics), statins for such patients having LDL cholesterol over 120 mg/dl was used in 99% of patients (vs. 70-96%) and calcium supplements for postmenopausal women in 70% (vs. 7-42%).

19) Public expectation from physicians during visits in primary care clinics. A survey of 371 patients attending primary care clinics in Jerusalem, showed that only 42% of patients were expecting a prescription for medications and about 60% physical or ancillary testing, while 88% wished to get advice for disease prevention and health life-style and over 95% wanted explanation and listening. In practice, less than 20% of patients are getting support for preventive care.¹⁸ These observations, remarkably similar to recent reports in the UK,¹⁹ may have profound implications for medical education and practice.

¹⁵ Cainzos M. Surgical Infection Control. *Surgical Infections*. 2005;6(1):7-17.

¹⁶ Berenholtz SM, Pronovost PJ, Lipsett PA, et al. Eliminating catheter-related bloodstream infections in the intensive care unit. *Critical Care Medicine*. 2004;32(10):2014-2020.

¹⁷ Majumdar SR, Rowe BH, Folk D, et al. A Controlled Trial To Increase Detection and Treatment of Osteoporosis in Older Patients with a Wrist Fracture. *Ann Intern Med*. 2004;141(5):366-373.

¹⁸ Baron-Epel O. Consumer-oriented evaluation of health education services. *Patient Educ Couns*. 2003;49(2):139-47.

¹⁹ Little P, Everitt H, Williamson I, et al. Preferences of patients for patient centred approach to consultation in primary care: observational study. *BMJ*. 2001;322(7284):468

20) Smoking and physical exercise among medical students. A survey of attitudes, knowledge and behavior was recently completed for over 80 medical students at the end of their studies at the Hadassah-Hebrew University Medical School. The results showed severe deficiencies of knowledge: nearly half of the students denied established effects of passive smoking and many didn't know protective effects of exercise on conditions such as diabetes, hypertension, hip fracture and cancer. About a quarter of them were smokers and a majority do not exercise regularly. Most students say they had little exposure to role-model-physicians actually counseling patients on life-style during their clerkships at Hadassah, 67% felt necessary to increase teaching of these topics at the School of Medicine. These findings, which were discussed with the Faculty Dean, join other observations²⁰ suggesting an urgent need for a change in curriculum of medical education towards health promotion and prevention.

21) Promotion of physical activity at the National level. According to the Surgeon General,²¹ "regular physical activity that is performed on most days of the week reduces the risk of developing or dying from, some of the leading causes of illness and death in the U.S.". The Center for Diseases Control recently reported²² that lack of exercise is so prevalent in modern society that it could be causing nearly 400,000 deaths each year in the U.S. resulting from diabetes, hypertension, cardiovascular disease and cancer. Surveys in Israel show that over 70% of people are sedentary. The National Council for Health Promotion at the Ministry of Health appointed a committee to address this issue. The committee (headed by Prof. M. Brezis) with help from experts from Hadassah's School of Public Health, developed and recently published a wide range of recommendations, leading to instructions by the Director General of the Ministry of Health, with potentially far-reaching implications for education, marketing, and regulation.²³

²⁰ Notzer N, Abramovitz R. Clinical learning experiences of Israeli medical students in health promotion and prevention of cancer and cardiovascular diseases. *IMAJ* 2002;4:149-152.

²¹ United States. Public Health Service. Office of the Surgeon General, National Center for Chronic Disease Prevention and Health Promotion (U.S.), President's Council on Physical Fitness and Sports (U.S.). Physical activity and health: a report of the Surgeon General Atlanta, Ga.; 1996 <http://www.cdc.gov/nccdphp/sgr/sgr.htm>.

²² Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual Causes of Death in the United States, 2000. *JAMA*. 2004;291(10):1238-1245.

²³ <http://www.health.gov.il/pages/default.asp?pageid=3465&parentid=10&catid=6&maincat=1>

Quality of Intensive Care: Hadassah compared to Israeli National & U.S.

Several comparative surveys shed some light on the quality of intensive care at Hadassah.

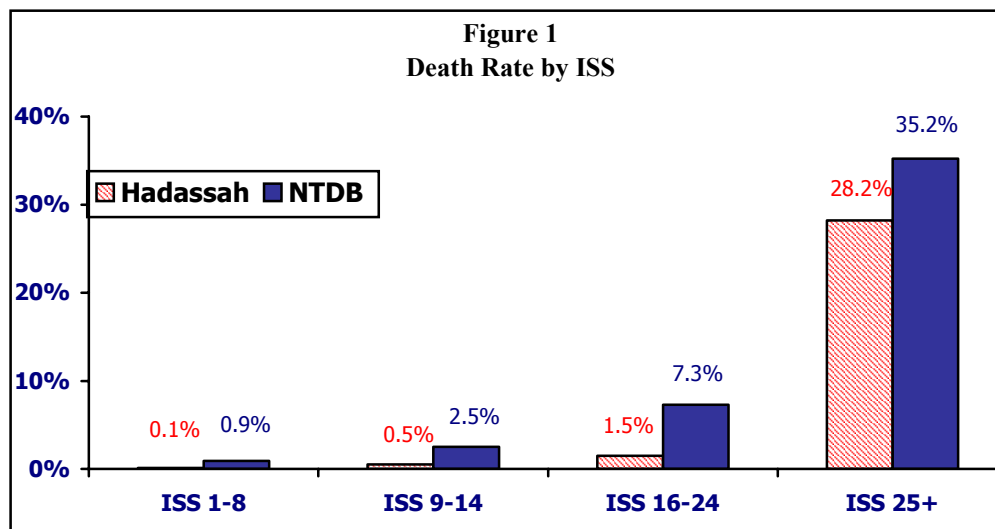
22) Quality of Treatment of Trauma Patient. A comparative study of the trauma data of Hadassah Ein-Kerem and 51 trauma level I hospitals in the USA.

Project participants: Dr. Yoav Mintz, Prof. Avraham Rivkind and Dr. Rony Braunstein

Background: In Israel, Hadassah and five other hospitals have trauma centers defined as level-I because of their expertise and capacity to handle trauma injuries of all kind. The current study compares survival at Hadassah to those in level I trauma hospitals in the USA.

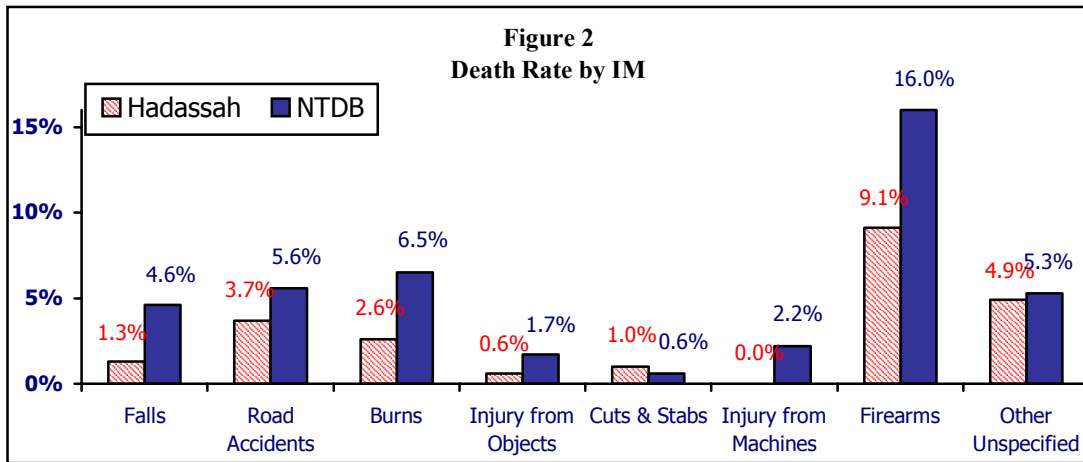
Methods: Data on trauma patients at Hadassah derives from the Israeli national trauma registry system, including a total of 7,391 patients, and operated by the Gertner institute for epidemiology and health policy in Israel. U.S. data on trauma patients derives the National Trauma Data Bank (NTDB) of the American College of Surgeons Committee on Trauma, covering 51 level-I trauma centers, including a total of 263,524 patients. The timeframe is from year 1999 thru 2003.

Results: The major outcome, the average rate of death, was 2.6% at Hadassah compared to 5.8% in the USA. Mortality rates were also compared stratified according to the gravity of trauma, estimated by the Injury Severity Scale (ISS) and the analysis is shown in Figure 1 below.

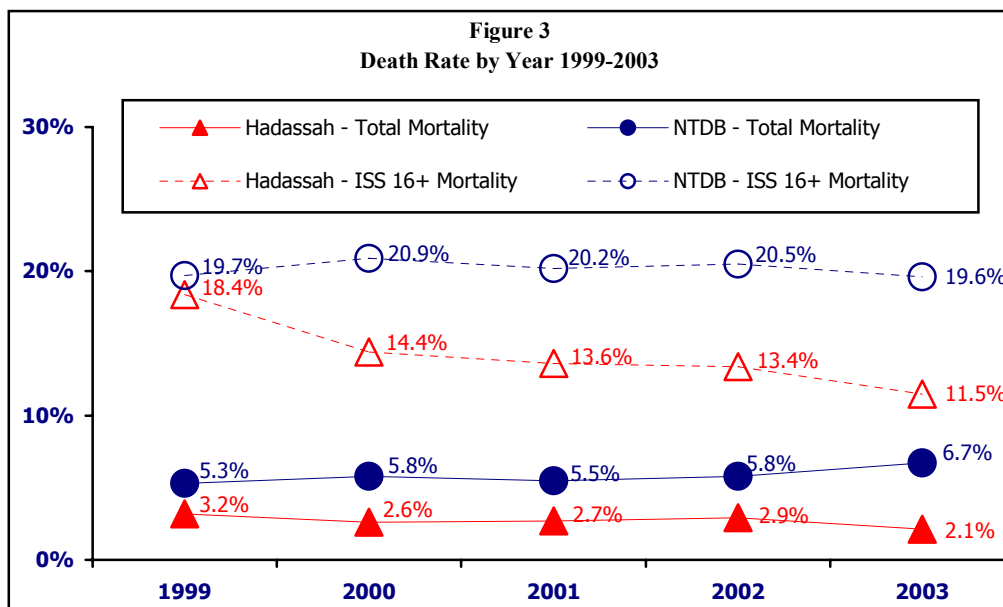


From Figure 1, it appears that for each sub-group of injury severity, the death rate at Hadassah is lower than the mean death rate in the U.S. (NTDB) data.

A similar finding can be noticed when one examines the death rate by Injury Mechanism (IM). For most types of injury mechanism, as shown in Figure 2 below, the death rate at Hadassah appears lower than the mean death rate in the U.S. (NTDB) data (only in the category of cuts and stabs is the death rate in Hadassah higher (1.0%) than the average death rate (0.6%) of the NTDB data).



As shown in Figure 3 below, for each year from 1999 to 2003, the death rate at Hadassah (triangles) appears is lower than the average death rate of the U.S. (NTDB) data (circles). This conclusion holds both for total mortality (shown in closed symbols) and for the mortality of most severe patients (defined as having an injury score over 16, ISS 16+, shown in open symbols).



Conclusion and future plans: Hadassah appears to have an overall lower death rate (2.6%) than 51 U.S. level-I trauma centers (where the death rate is 5.8%). If improved survival at Hadassah is related to higher performance, such quality applied to the 263,524 patients in the US trauma centers, would have prevented about 8,400 deaths.

The data were sent for review to Prof. Ellen J. MacKenzie, Ph.D., Director, Center for Injury Research and Policy, Johns Hopkins Bloomberg School of Public Health. She replied: "The data you sent on is most interesting! You must be doing something right at Hadassah!". Attempts will be made to further analyze these data by adjustments for confounding factors and alternate modeling,²⁴ and to focus our comparison with the most experienced units in the U.S. A possible reason for improved performance at Hadassah could relate, at least in part, to the general availability of senior trauma, orthopedic and other specialty surgeons at critical times, during evening and night shifts, while similar cases would often be handled, in the U.S, by residents and non-specialist surgeons.

23) Quality of Neonatal Intensive Care at Hadassah. A comparative study of the data of Hadassah Mt Scopus and other hospitals in Israel.

Project participants: Dr. Zivanit Ergaz and Prof. Ilan Arad

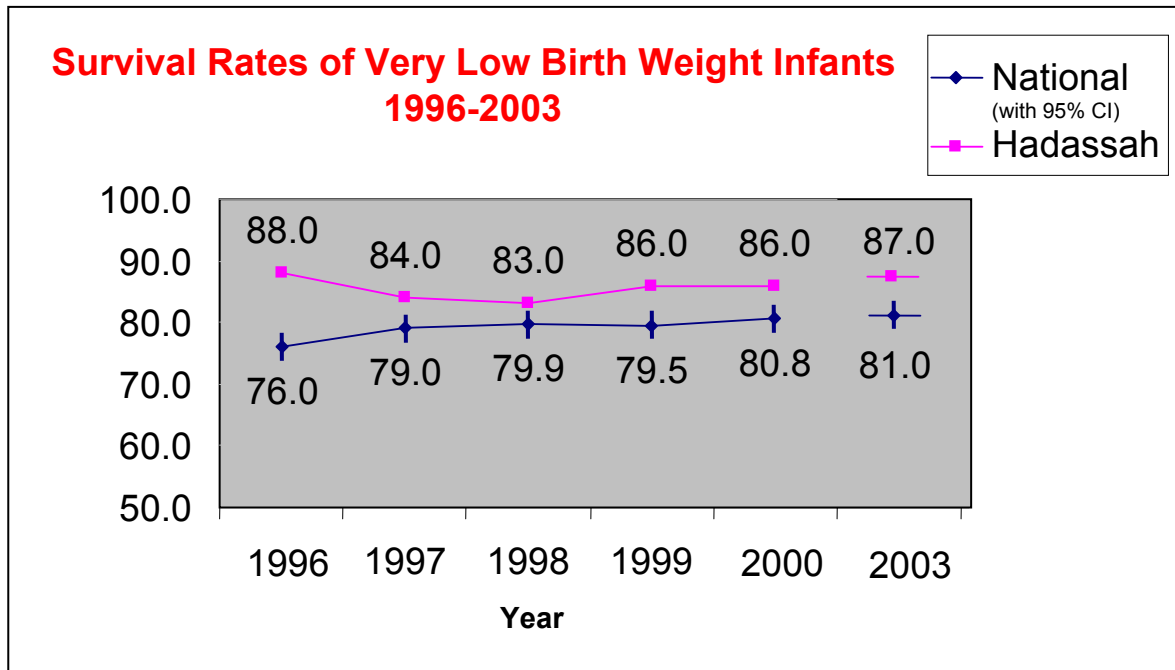
Background: Hadassah participates in the Israel National Very low birth Weight (VLBW) infant database since its establishment in 1995, in collaboration of all neonatal departments in Israel, and coordinated by the Women and Children's Health Research Unit of the Gertner Institute for Epidemiology and Health Policy Research, Sheba Medical Center, Tel-Hashomer. The aims of the database are to identify trends in morbidity, mortality and results of therapies over time, as well as to provide a basis for policy planning, resource allocation and quality improvement at a national, regional or departmental level.

Methods: Data are prospectively collected on a pre-structured form and include information on the parents; maternal pregnancy history and antenatal care; mode of delivery; infant's status at birth; procedures and morbidity during hospital stay; and outcome at discharge. Data are sent to a central coordinator, checked for missing items and logical errors, corrected, completed, and

²⁴ Frankema SPG, Steyerberg EW, Edwards MJR, van Vugt AB. Comparison of Current Injury Scales for Survival Chance Estimation: An Evaluation Comparing the Predictive Performance of the ISS, NISS, and AP Scores in a Dutch Local Trauma Registration. *Journal of Trauma-Injury Infection & Critical Care* March. 2005;58(3):596-604.

computerized. Patient information is cross checked with the national birth registry, and any missing data are requested from the birth hospital. Data is collected on all infants until discharge home or death.

Results: The figure below shows consistent survival advantage at Hadassah (upper curve) in comparison to National average (lower curve) for years available of survey (1996-2000). In the most recent set of data, survival rate for 2003 at Hadassah was 87%, compared to 81% for the National average.



For international comparison, the National Institute of Child Health and Human Development Neonatal Research Network (15 centers in the U.S.) gives detailed outcomes for infants with low birth weights: survival rate for year 1999/2000 was 86%, similar to the rate at Hadassah.

Conclusion and future plan: Quality of neonatal intensive care at Hadassah appears fair by National and US standards. A current quality project will evaluate the rate of nosocomial blood infection in the neonatal intensive care unit.

24) Quality of adult intensive care at Hadassah. A study comparing Hadassah and other hospitals in Israel. Main investigator: Prof. Elisheva Simchen, Ministry of Health & School of Public Health, Hebrew University.

Background: The Ministry of Health evaluated how severe is the shortage of beds for adult intensive care in Israel.

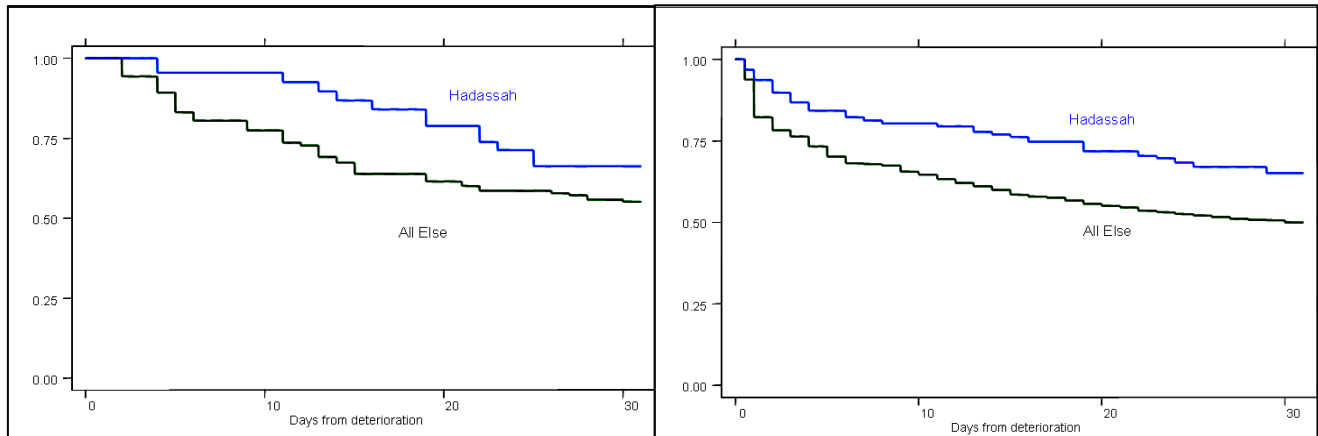
Methods: Israeli hospitals were surveyed for critically ill patients in general wards and intensive care units in all hospitals. Severity of illness used APACHE II score.

Results: The proportion of critically ill among hospitalized patients was 5.5%. Near half of them were in intensive care units (ICU) while, at Hadassah, two third. As shown in the Table below, their severity score was higher at Hadassah.

Distribution and characteristics of critical ill patients

	Hadassah			All Hospitals		
	ICU N=50	Other ICU N=61	Regular N=50	ICU N=190	Other ICU N=171	Regular N=349
Proportion of patients by department, (%)	31.1	37.9	31.1	27.0	24.0	49.0
Age, (mean)	55.7	63.2	67.3	60.9	62.8	68.4
Gender, (%)						
Male	66.0	57.4	46.0	59.0	58.0	49.0
Female	34.0	42.6	54.0	41.0	42.0	51.0
APACHE II Mean score	26.2	23.4	22.6	23.9	21.7	21.4
APACHE II, (%)						
Score 0-15	12.0	13.1	23.1	18.0	24.0	24.0
Score 16-24	30.0	42.6	35.9	35.0	40.0	42.0
Score>24	58.0	35.9	41.0	47.0	36.0	33.0

Survival advantage at Hadassah was apparent (see Figure below) both for intensive care units and regular wards and was confirmed later in a repeated incidence survey.



Survival for ICU patients (left panel) and for all patients (right panel) up to 30 days Hadassah, upper curve vs. other hospitals, lower curve

General conclusion and future plans: The quality of intensive care for the critically ill, for the trauma patient and for the neonate appears consistently superior by national and/or international standards.

Quality of respiratory support in patients outside intensive care units: Because of bed shortage in intensive care, patients often receive respiratory support in general wards. Preliminary observations from a recently completed survey of 120 such patients, show that suboptimal recording of ventilatory conditions and physician's orders is common; simple methods to assess readiness to wean from respirator (such as the spontaneous breath test) are not performed in a systematic manner; and in fact, many first-years residents (caring for these patients) do not know these techniques - shown to reduce duration of respiratory support and length-of-stay. Pending final analysis of data, it appears that earlier training of residents on respiratory support is needed and will be discussed with people in charge of residency curriculum.

In addition, the quality of pediatric intensive care will be systematically evaluated, starting from next year, using central data management software in routine use in modern facilities in the US (the PICUES system for quality assessment is described at <http://www.dccchildrens.com/picues/>). The project will allow direct comparison of performance at our pediatric intensive care unit with a large set of units in the US. The main initial challenge is to establish an interface between our computer database and the data collecting system required by the PICUES system.

Future Challenge: Comprehensive Electronic Support For Quality & Safety

An important emerging question relates to the proper future strategy for collecting performance data, given progress made in the electronic medical record. Couldn't we rely on computerization to have an ongoing, low-cost, recording of performance measures? Could the computer monitor activities and feedback to clinicians in real-time - for instance to prevent medication errors? The following recently encountered problems suggest need for special strategic planning of electronic support to clinical quality and safety, drawing from U.S. examples.

Example 1: Quality control in cardiac surgery. Prof. Glenville, new Head for cardiac surgery at Hadassah, routinely collects information on every patient for quality control. For that purpose, he uses a simple (Excel-based) software tool that he brought with him from England - see below.

A snapshot of Prof. Glenville's database for quality control

TOTALS		Mortality		1		0		252		57		43				
CASES: 327		12		1=for disorder of ascending arch or descending aorta		0=NO 1=YES		0=N/A L=LIMA L=LIMA L=LIMA		L=LIMA L=LIMA L=LIMA		L=LIMA L=LIMA L=LIMA				
Ver 0.96 beta.C1		0=NO 1=YES						1=w.blood C R=Radial R=Radial R=Radial		M=RIMA M=RIMA M=RIMA		M=RIMA M=RIMA M=RIMA				
MORTALITY RATES (%)								3=crystal CP V=LSV V=LSV V=LSV		S=SSV S=SSV S=SSV		S=SSV S=SSV S=SSV				
								4=Xclamprib O=other O=other O=other								
Parsonnet Score	Parsonnet Mortality	EuroSCORE Mortality	Mortality	Date of op.	Suriname	Surgery on thoracic aorta	Post infarct septal rupture	Consultant	Second Assistant	Anaesthetist	Scrub Nurse	Perfusionist	Myocardial protection	LAO	D1	D2
313 15	17%	7%	7%	2001 ינואר 12	NAME 310	0	0	CONS	ASST 4	GAS 3	NURSE A SEWELL		2			
314 3	1%	2%	2%	2001 ינואר 12	NAME 311	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L	V	
315 7	5%	2%	2%	2001 ינואר 15	NAME 312	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L	V	
316 11	9%	3%	3%	2001 ינואר 15	NAME 313	0	0	CONS	ASST 4	GAS 3	NURSE A AKINS		4	L		
317 5	5%	3%	3%	2001 ינואר 16	NAME 314	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L		
318 5	5%	3%	3%	2001 ינואר 16	NAME 315	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L		
319 5	5%	2%	2%	2001 ינואר 19	NAME 316	0	0	CONS	ASST 4	GAS 3	NURSE A JANE		3			
320 25	31%	5%	5%	2001 ינואר 19	NAME 317	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L		
321 10	9%	7%	7%	2001 ינואר 22	NAME 318	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L	V	
322 0	1%	7%	7%	2001 ינואר 22	NAME 319	1	0	CONS	ASST 4	GAS 3	NURSE A POWELL					
323 10	9%	3%	3%	2001 ינואר 22	NAME 320	0	0	CONS	ASST 4	GAS 3	NURSE A PAPWOR		2	L		V
324 6	5%	2%	2%	2001 ינואר 22	NAME 321	0	0	CONS	ASST 4	GAS 3	NURSE A AKINS		2	L		
325 0	1%	0%	0%	2001 ינואר 23	NAME 322	0	0	CONS	ASST 4	GAS 3	NURSE A N		0	L		
326 1	1%	2%	2%	2001 ינואר 24	NAME 323	0	0	CONS	ASST 4	GAS 3	NURSE A LIZ		2			
327 22	31%	4%	4%	2001 ינואר 26	NAME 324	0	0	CONS	ASST 4	GAS 3	NURSE A NEIL		2	L		
328 41	31%	14%	14%	2001 ינואר 26	NAME 325	0	0	CONS	ASST 4	GAS 3	NURSE A LIZ		2	L		
329 15	17%	7%	7%	2001 ינואר 29	NAME 326	0	0	CONS	ASST 4	GAS 3	NURSE A POWELL		2			
330 3	1%	2%	2%	2001 ינואר 29	NAME 327	0	0	CONS	ASST 4	GAS 3	NURSE A POWELL		4	V		
331 5	5%	1%	1%	2001 ינואר 29	NAME 328	0	0	CONS	ASST 4	GAS 3	NURSE A NONE		0	L	V	
332 5	5%	2%	2%	2001 ינואר 30	NAME 329	0	0	CONS	ASST 4	GAS 3	NURSE A JOHN		2			
333 5	5%	3%	3%	2001 ינואר 30	NAME 330	0	0	CONS	ASST 4	GAS 3	NURSE A D		0	L		

In order to avoid storage fragmentation of clinical information, we tried to import Prof. Glenville's tool into Hadassah's electronic medical record (EMR - project named in Hebrew MACHAR). A powerful "form designer" from MACHAR was used and full production software was developed over a few months. Simple problems emerged that prevented implementation of the tool:

1. Using current EMR system, output & printing data (if only to verify input) is not at all user-friendly. Data should be organized as sections to visually apprehend scope of information: such versatile output, available in Glenville's tool, may be available only in future versions of the EMR.
2. Retrieval & handling of data in real time from current EMR is not possible. To help clinician's decision - as an electronic support system - data should be immediately processed and feedback provided to the physician, a feature available in Glenville's software, where analysis and charts can be presented at all times.

Such features could probably be developed with additional resources - over & above current planning and budget for the EMR project. More importantly however, it now appears that database functions for quality & safety are conceptually different from EMR, as also apparent in the next examples.

Example 2: Quality control in Obstetrics and Gynecology.

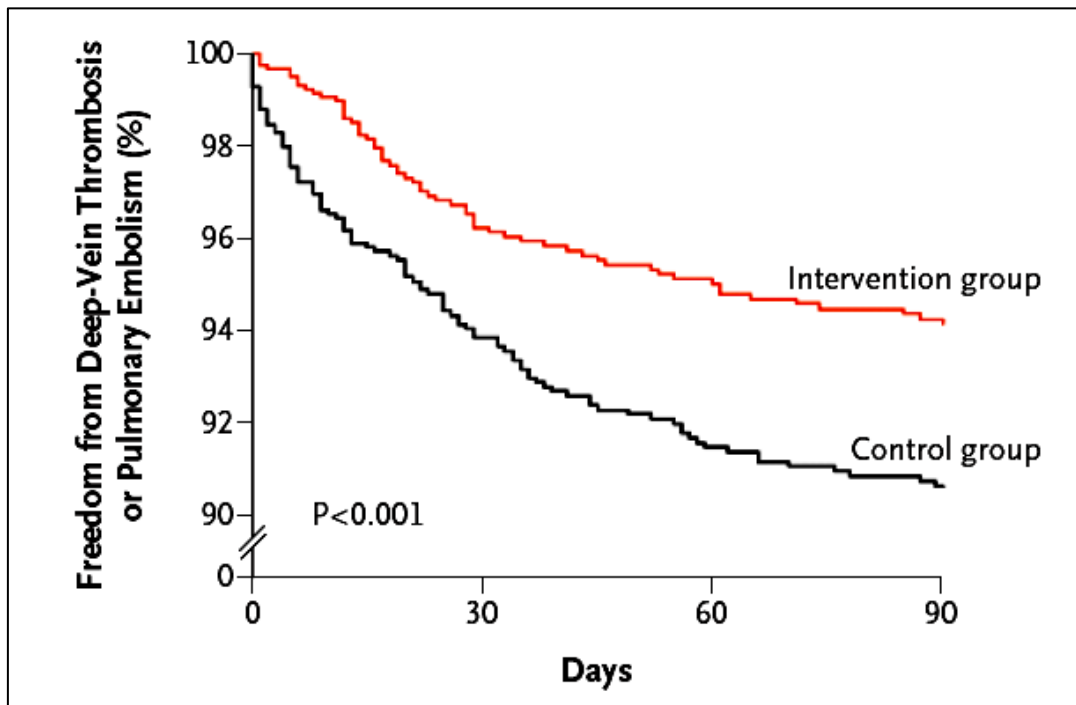
Electronic medical record has been introduced in Obstetrics & Gynecology at Hadassah for over a year (using Birth-Care management system from Ness Technologies, adopted by many wards in Israel). We recently wished to address a simple question on the quality of care in this field: what is the rate of complications for cesarean sections? After a few months of work (with dedicated help from several computer experts), it turns out this apparently simple task is quite difficult and may take another few months to complete due to complex technical issues.

A recent tragedy at Boston's Beth Israel hospital (with a young woman losing both fetus and uterus) led to a major system change. Unfortunately similar mismanagement may happen everywhere. As Dr. Benjamin Sachs, Harvard Professor and Chief, Obstetrics & Gynecology, explains,²⁵ evaluating outcomes is essential to any efforts at systems change and monitoring adverse events is becoming critical to quality improvement. Since there are currently no nationally accepted standard measures to assess obstetric outcomes, this task will require developing versatile information systems capable of rapidly answering questions related to quality of healthcare.

²⁵ Sachs BP. A 38-Year-Old Woman With Fetal Loss and Hysterectomy. JAMA. 2005;294(7):833-840.

Example 3: Developing electronic reminders

Electronic reminders can be powerful tool for enhancing quality of healthcare. As recently reported,²⁶ the institution of a computer-alert program increased physicians' use of prophylaxis and markedly reduced the rates of deep-vein thrombosis and pulmonary embolism among hospitalized patients at risk (see figure below).



As discussed in previous reports to the Board, we surveyed at Hadassah the usage of prophylaxis for thrombosis, improved it by an intervention and concluded that electronic reminders could be an important tool to monitor and further improve compliance.

Implementation of such a system, will need coding for identification of patients at risk (current clinical information is in free text), algorithm-based processing of data for immediate feedback to clinician, monitoring of physician's orders for optimization of therapy²⁷ and output for periodic performance evaluation. It appears therefore

²⁶ Kucher N, Koo S, Quiroz R, et al. Electronic Alerts to Prevent Venous Thromboembolism among Hospitalized Patients. *N Engl J Med.* 2005;352(10):969-977.

²⁷ Goldhaber SZ, Dunn K, MacDougall RC. New Onset of Venous Thromboembolism Among Hospitalized Patients at Brigham and Women's Hospital Is Caused More Often by Prophylaxis Failure Than by Withholding Treatment. *Chest.* 2000;118(6):1680-1684.

that database functions for quality & safety are conceptually different than a simple electronic medical record.

Information technology has been underused in healthcare because of a variety of barriers.²⁸ Electronic support can markedly enhance clinical quality, by improving communication and medication safety, by assisting in calculation and supporting decisions, by monitoring and allowing rapid response to and tracking of adverse events.²⁹

Harvard-Brigham & Women's Hospital in Boston has a permanent special team of physicians and computer experts, investing several millions of dollars to develop electronic systems that are estimated to have saved even more money, for instance by 80% reduction in medication errors.³⁰ Similarly, the Veterans Affairs Health Care System has made a remarkable transformation in creating a culture of quality and investing in modern information technology.³¹

The US Congress recently passed the Patient Safety and Quality Improvement Act, stating "The Secretary shall facilitate the creation of, and maintain, a network of patient safety databases that provides an interactive evidence-based management resource for providers, patient safety organizations, and other entities."

These examples suggest the need for considering at Hadassah appropriate strategy and planning of electronic support to clinical quality and safety.

²⁸ Hersh W. Health Care Information Technology: Progress and Barriers. JAMA. 2004;292(18):2273-2274.

²⁹ Bates DW, Gawande AA. Improving Safety with Information Technology. N Engl J Med. 2003;348(25):2526-2534.

³⁰ Kaushal R, Bates DW. Information technology and medication safety: what is the benefit? Qual Saf Health Care. 2002;11(3):261-265.

³¹ Greenfield S, Kaplan SH. Creating a Culture of Quality: The Remarkable Transformation of the Department of Veterans Affairs Health Care System. Ann Intern Med. 2004;141(4):316-318.

Conclusion

Further activities of Quality & Safety at Hadassah include workshops and lectures for students and staff as well as presentations of projects at several major institutions outside Jerusalem. This year, Hadassah presented 36 abstracts at the meeting of the Israeli Society for Quality in Medicine. We have now nearly 10 publications published, in press, or submitted for publication in international, peer-reviewed medical journals. A website describing the activities of our Center will be ready for airing in the next month.

In conclusion, diverse projects attempt to make healthcare at Hadassah more patient-centered, more evidence-based and more system-minded. While in some areas, noticeable improvements have been achieved, in others, increasing accountability by department heads for quality and safety may be a key to further successes.

Acknowledgments: Prof. Yoel Donchin, Prof. Elisheva Simchen, Prof. Avi Rivkind, Dr. Yoav Mintz, Prof. Ilan Arad, Dr. Zivanit Argaz-Shaltiel, Dr. Gil Leibowitz, Prof. Aryeh Ben-Yehuda, Dr. Rony Braunstein, Dr. Rami Oren, Ms. Lois Gordon, Ms. Nurit Porat and Ms. Penina Sharon, as well as many other physicians and nurses from the Committee for Clinical Quality & Safety and many medical students greatly contributed to projects implementation and to the preparation of this report.