Implementation of a PDA based program to quantify Urology resident in-training experience

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Introduction: *There currently is no simple and reliable mechanism for Residency program directors to assess how well their trainees are being exposed to all spheres of their specialty. We report on the use of hand-held personal digital assistants (PDA's) to document all clinical and academic activities of urology residents at one academic institution.*

Materials and methods: *Software was developed to create customized pick lists allowing residents to record all activities on their individual PDA's. Categories included Adult Ambulatory, Pediatric Ambulatory, Adult operative, Pediatric operative, and Academic. Activities were subcategorized into detailed pick lists and time-tracking fields. Residents synchronized with a central database on a standalone hotsync server.*

Results: *In the first 8 months, 21 178 resident-hours and 5333 activities were recorded. Preliminary observations can be made regarding how residents spend the majority of their time: 28% operative, 20% self-study, 19% ward work, 10% Academics, 6% ER consultations, 5% clinic, and 4% inpatient consultations. The most common adult diagnoses encountered while attending to clinic, ward, or ER consultations were lower urinary tract symptoms, urolithiasis and hematuria. Similarly for Pediatrics: neurogenic bladder, antenatal hydronephrosis, infection, and hypospadias were most often reported. Residents reported 5,333 activities, relating to the following spheres of Urology: academics (23%), endourology (18%), oncology (15%), lower urinary tract symptoms (10%), congenital anomalies (5%), urolithiasis (5%), reconstruction (5%), and infection (3%).*

Conclusions: *This tool provides an objective assessment of resident experience as it relates to selection of rotations, and for addressing curriculum weaknesses. It is applicable at a national level for the study of regional differences in training experience, and trends in graduate Urological education. With minimal effort it could be modified for application to other specialty training programs.*

Key Words: medical informatics, computer communication networks, medical technology

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Background

There currently is no simple and reliable mechanism for Residency program directors to assess how well their trainees are being exposed to all spheres of their specialty. The current reporting requirements of the Royal College of Physicians and Surgeons of Canada (RCPSC) are quite limited. Every 6 years all residency-

training programs at one institution are subjected to an external review. As part of that review process, information is requested from hospital information technology (IT) departments pertaining to the volumes of a very limited range of surgical cases performed at each training hospital. No quantitative assessment is made of an individual resident's breadth of procedural experience, participation in ambulatory clinics, or the academic activities pertaining to one's specialty. Similarly, there is no requirement or mechanism for an accurate account of how residents spend their time during different rotations, hospital sites, or years of training.[1] As a result, accreditation renewals are based on a subjective impression of how busy residents are, how satisfied they are with service-to-teaching ratios, and how the program is perceived by a nucleus of peers from across the country. We felt this was an inadequate reflection of what residents experience over the course of their 5 years of postgraduate training.

The Urology residency training program at the University of British Columbia (UBC) is a 5 year post-MD program which accepts three entry-level residents per year. Residents are geographically dispersed amongst four inpatient hospitals, and at least 10 ambulatory facilities. In addition, residents participate in a 3-4 month elective rotation at one of several local, regional, or national sites. It is impossible for program directors and other teaching faculty to objectively assess resident experience at all of these sites. We felt the need for a mechanism to record resident activities and time spent into one searchable database that was efficient, reliable, and compatible with current healthcare IT expectations.

With the explosion of popularity regarding PDA's, it was thought that this medium would provide a stable, consistent platform for our study. Self-reporting would be at the core of this initiative. To facilitate this, we required that data input biometrics be simple, rapid, portable and accurate. The Palm OS" was selected due to its widespread familiarity to users, simplicity of function, capacity for expansion, and relative ease of software development.

Methods

During the 8-month period Sept 1st 2001 – April 30th 2002 all 15 residents in the UBC Division of Urology training program were required to participate in the Urology Resident Activity Information System (URAIS). In exchange for this mandatory participation, residents were provided with Palm" m505 PDA's. This model contains 8MB of native random access memory and an expansion slot for additional peripherals.

Activity forms

Custom software was developed in conjunction with Resilience Software Inc., an independent software design firm specializing in Palm" OS software. Five domains of activity were created to choose from: "Adult ambulatory", "Adult operative", "Pediatric ambulatory", "Pediatric operative", and "Academic". Activities falling within the "Academic" domain include things such as self-study, mock examinations, formal rounds, didactic teaching sessions etc. Drop down menus were created to allow residents to choose from 77 diagnostic, 117 procedural and 20 academic activities that covered all aspects of Urology. For operative procedures Residents choose whether they perceive that their role is as the primary surgeon, 1st assistant, or 2nd assistant.

Each of the activities and diagnoses within these domains is linked to one of 14 spheres of urology. In this manner, when a given activity is chosen, it is automatically recorded as belonging to a sphere of Urology without the need for further user input. The administrator (AEM) can modify pick list choices on the central computer. These modifications are automatically updated at the time of PDA-to-server synchronization.

The software also provides data fields that allow for users to record other pertinent information and notes at their discretion. (e.g. medical record numbers, notes pertaining to morbidity and mortality rounds, teaching cases, research etc.)

Time logs

In addition to cataloguing specific activities, residents were also required to estimate how they apportioned their time amongst 14 different categories at the end of each day. Trainees in their pre-urology rotations were only required to maintain their daily time log. To date, specific diagnostic and procedural activity lists have not been developed for non-urology rotations.

Data accrual

Residents synchronized with a single hotsync server located at a central site approximately twice monthly during regularly scheduled academic half-day sessions. Data from all 15 residents was automatically transferred to a Microsoft Access" database at the time of synchronization. The URAIS software allows for standard reports to be generated for individual residents, individual sites and rotations, specific years

of training, or for the 15 residents as a whole. Data pertaining to an individual resident's experience can be easily exported to a Microsoft Excel" spreadsheet for more detailed study.

The central database is controlled by the program director. Residents can neither generate reports, nor modify the database.

Results

Cost

Total cost was $51 593 (Canadian dollars). This total represents the cost of 15 Palm m505 PDA's, one additional PDA synchronization cradle and 500 billable hours by the software consultant. Costs not included in this total are those pertaining to acquisition of a common resident desktop computer, and printer ($4343). Partial funding (54%) for software development was obtained with an unrestricted educational grant from Bayer Pharmaceuticals Canada Inc. The remaining costs were borne by the UBC Division of Urology.

Resident activities

There were 5,333 activites reported according to the following distribution: Adult operative 2304, Academic 1240, Adult ambulatory 910, Pediatric ambulatory 516, and Pediatric operative 363 Figure 1. A synopsis of the distribution of these activities and the most common diagnoses encountered is shown in Figures 2-4.

Overall, residents reported the greatest amount of exposure (66%) to the spheres of academic endeavors, endourology, oncology, and lower urinary tract

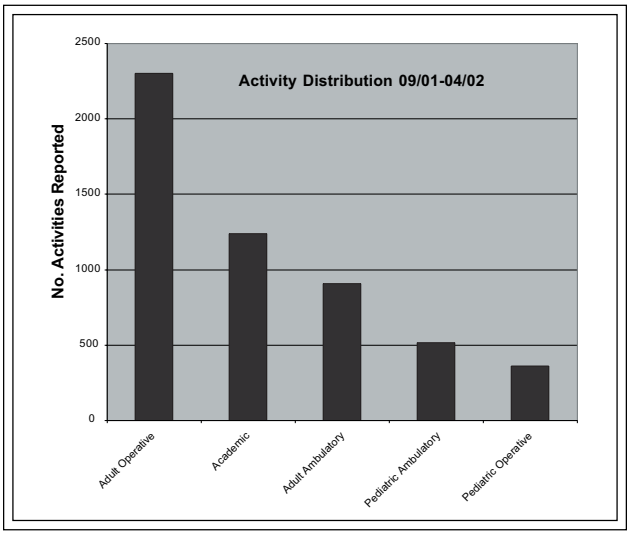

Figure 1. Distribution of activities.

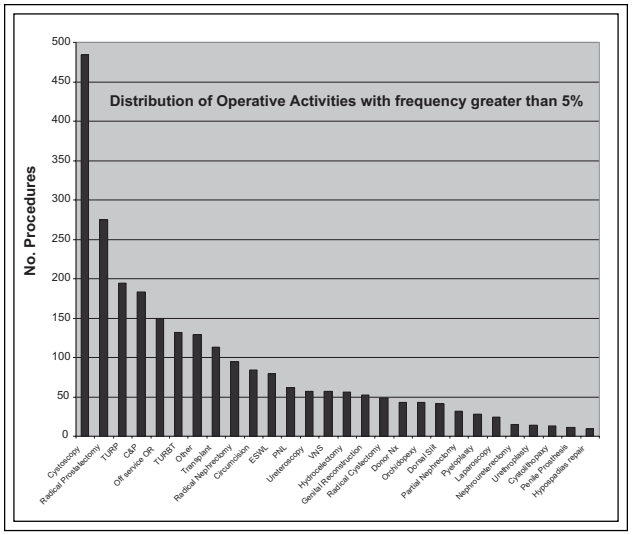

Figure 2. Distribution of operative activities. (C&P = Cystoscopy and retrograde pyelogram, VNS = Vesical neck suspension).

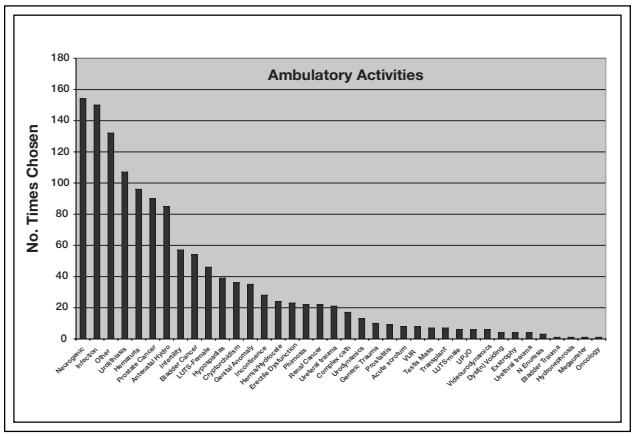

Figure 3. Distribution of ambulatory activities.

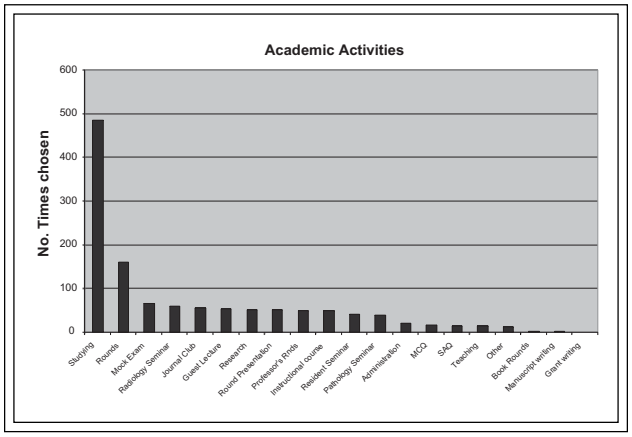

Figure 4. Distribution of academic activities.

TABLE 1. **Distribution of activities reported according to sphere of Urology**

Sphere	% Adult	% Pediatric	% Overall
Academic	0	0	23.04
Endourology	28.02	4.6	17.61
Oncology	24.21	1.1	14.73
LUTS	10.78	23.11	10.38
Other	12.38	7.01	8.62
Congenital anomalies	0.09	31.11	5.3
Urolithiasis	7.71	0.77	4.76
Reconstruction	1.9	21.14	4.71
Transplant	5.19	1.2	3.32
Infection	2.27	9.31	2.94
Andrology	3.38	0	2.03
Female Urology	1.75	0	1.05
Trauma	1.57	0.66	1.05
MIS	0.74	0	0.44

symptoms (LUTS). Little exposure (<5%) was recorded for activities related to the spheres of transplantation, infection, andrology, female urology, trauma, and minimally invasive surgery Table 1. The three operative procedures recorded with the greatest frequency were cystoscopy, radical prostatectomy, and transurethral prostatectomy (TURP).

Time tracking

There were 21 178 hours recorded over the study period. The breakdown of time spent for all residents and according to year of training is shown in Table 2. O verall, residents spend approximately 80% of their time operating, studying, performing ward duties, or participating in other academic endeavors. Only a small portion of time (5%) is spent in the ambulatory clinic.

Discussion

We initiated this project because of a perceived lack of accountability for our residents' activities and time. We aimed to provide a user-friendly mechanism to achieve an objective assessment of time utilization, procedural and ambulatory activities, and the exposure our trainees received to all spheres of their specialty. In order to capture the data efficiently it was felt necessary to employ hand-held PDA's rather than desktop software. The latter requires that participants log their activities and time tracking at a specific computer. This usually occurs at home, at the end of the day, rather than as the events are occurring and leads to problems with compliance and accurate data acquisition. One could argue that a paper-based method to record clinical experience would be less labor intensive to establish, and less costly. However, experience with this mode of data acquisition has shown it to be suboptimal in terms of compliance, and timeliness.[2] Furthermore, the program director's administrative burden is greatly reduced by the power of a relational database which allows customized reports and queries to be generated in seconds.[3]

While other authors have employed PDA's to track surgical cases, procedures, and/or ambulatory encounters, to our knowledge this is the first application that records all aspects of a resident's

TABLE 2. **Time-tracking distribution amongst 14 categories**

Time Type	Hours	%
OR	5869.8	27.7
Study	4215.2	19.9
Ward	3982.4	18.8
Academic	2594.3	12.3
Consult-ER	1182.5	5.6
Consult-Clinic	1031.3	4.9
Consult-IP	789.5	3.7
Rad review	448.5	2.1
Research	316.8	1.5
Path review	266.0	1.3
Admin-Res	229.8	1.1
Other	152.1	0.7
Admin-Hospital	65.2	0.3
Admin-Div	35.0	0.2
Totals	**21178**	**100**

experience.[2-10] As seen from our breakdown of activities and time-tracking, operative procedures are only one facet of a surgical trainee's experience. As specialties evolve in their focus, and training programs adapt to changes in patient demographics or resource allocation, it is imperative that we assess the impact of these forces upon postgraduate medical education. Without capturing data on all spheres of one's specialty it is impossible to assess for trends in residency education.

There are obstacles to establishing a relational database such as URAIS. For example, resident compliance is required. We currently estimate that a modest 5 minute per day is required for data entry. Still, human nature being what it is, there are individuals who require ongoing reminders to enter data and synchronize in a routine fashion. In addition, ongoing software modification is necessary to address issues regarding the updating of pick lists as new procedures arise. Initially there were a high proportion of operative procedures recorded as "other". As pick lists are expanded to provide more choices, and residents are better informed of these choices, this category should decrease. It inevitably has become necessary to expand our reporting software as we evolve from the initial stage of data input to that of translation of data into meaningful information. There must be at least one individual driving the project and auditing quality control so that data is entered correctly, completely, and in a timely fashion. Time and money are required for these endeavors. There currently is little or no funding for postgraduate medical education in Canada, certainly not for projects of this magnitude.[11,12]

We are currently only at the stage of data acquisition. To date we have not acted upon our observations. For example, changes or deletions to resident rotations or modifications to our academic curriculum have not yet occurred based upon the observations made during the first 8 months of URAIS. We plan to implement changes when more complete site-specific data is available. It is anticipated that 1-2 years of data acquisition will be necessary to make rational decisions in this regard.

The data as presented raises more questions than answers: What is the *right* distribution of time and activities for residents? How does resident experience compare to that of attending staff? Should it even be the same as that of those in full time clinical practice? How does the UBC experience compare to other Canadian and North American training programs? These questions are answerable. In fact we are in the process of expanding URAIS to other Canadian Urology training programs. This will require synchronization via an internet conduit, and establishment of a web site where the database will reside. In this manner, residents and program directors will be able to access and update their own data from a distance, in a secure fashion. In addition, comparisons to other programs can be made. A pilot study of staff time utilization compared to residents is also currently being conducted at our institution.

While the short-term data presented is of interest to urologists, it is insignificant in comparison to the potential applications of the URAIS software. For example, benchmarking and identification of centres of excellence in specific domains of urological education would be possible. Based upon this information, residents and program directors could schedule elective rotations at other sites in order to capitalize on strengths and minimize weaknesses in their program. The study of trends in graduate urological education over time would be feasible. Furthermore, with minimal modification and cost this tool can serve as a template to allow for other medical and surgical training programs to quantify resident experience and time utilization.

Conclusions

This tool allows for an objective assessment of Urology resident experience. It provides data necessary for the rational selection of rotations, and for addressing curriculum weakness. It has potential applications at a national level to allow for the study of regional differences in training experience, and trends in graduate urological education. With minimal time and effort it can be modified for application to other specialty training programs. □

References

1. The Royal College of Physicians and Surgeons of Canada. Standards of accreditation for residency programs. http://rcpsc.medical.org Accessed 03/07/2002.
2. Cherry NA, Qanzel KR, Shapiro H. Personal digital assistants: a survey of how useful residents think they would be in the clinical environment. *Annals RCPSC* 2002;35():435-439.
3. Malan TK, Haffner WHJ, Armstrong AY, Satin AJ. Hand-Held computer operating-system program for collection of resident experience data. *Obstetrics and Gynecology* 2000:96(5):1792-1794.
4. Sandrick K. Surgeons, pocket PDA's to end paper chase. *Bulletin of the American College of Surgeons* 2002;87:No 1.
5. Garvin R, Otto F, McRae D. Using Handheld Computers To Document Family Practice Resident Procedure Experience. *Fam Med* 2000;32(2):115-118.

6. Rosenthal M, Wolford RW. Resident Procedure and Resuscitation Tracking Using a Palm Computer. *Academic Emergency Medicine* 2000;7(10):1171.
7. Fischer S, Lapinsky S, Weshler J, Howard F, Rotstein LE, Cohen Z, Stewart TE. Surgical Procedure logging with the use of a hand-held computer. *Can J Surgery* 2002;45(5):345-350.
8. Topps D, Hall D. Electronic Procedure Logs: Taking it further. *Academic Medicine* 2002;77:756.
9. Bird SB, Zarum RS, Renzi FP. Emergency Medicine Resident Patient Care Documentation Using a Hand-held Computerized Device. *Academic Emergency Medicine* 2001;8(12):1200-1203.
10. Manning B, Gadd CS. Introducing handheld computing into a residency program: preliminary results from a qualitative and quantitative inquiry. *Proc AMIA Symp* 2001;428-432.
11. MacNeily AE. Challenges in Postgraduate Urological Education. *The Canadian Journal of Urology* 2001;8(5):1355-1364.
12. MacNeily AE, MacFarlane JK, Findley RJ. The Cost of Running a Surgical Residency. Survey of Canadian Program Directors. *Annals RCPSC* 2002;35(6):363-366.