

Managing Information at MUSC

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MUSC is a dynamic institution, with evolving policies and business processes. The continuous and efficient flow of information is essential for executing our medical, educational, research and business objectives. Computing, our internal internet, and the external internet are *enabling technologies* that permit us to bring together information from various sources, extract what is essential for our specific needs and perform our specific job functions. Many of our current processes are paper dependent and, by reengineering our business and administrative processes to include internet connectivity, we will be able to take advantage of internet accessible data repositories.

What makes working within the *internet era* different from the paper/phone era? Simply stated, the internet, like the phone, is an *enabling technology*. It enables us to extend the range of what we can visually see just as the telephone extends the range of our voice. Reengineering our processes is necessary so that we can take advantage of our extended vision. Used appropriately, locating, accessing and transporting information via the internet permits us to accomplish institutional objectives more efficiently. What the internet brings to us is *connectivity*, the ability to access information from diverse sources, extract it, manipulate it and then make decisions. This is a new paradigm, but the fact that useful internet and computing innovations appear every 18-24 months means that we must learn how to manage our affairs with stability, direction, and prudence in the presence of this unstable emerging technology.

The President's Goal: the convergence of 6 colleges to one university

To transform the 6 autonomous colleges of MUSC into a single university. Our strategy is to build an IT infrastructure, along the lines of a public utility where students, faculty and staff can "plug into" the network, access information, perform their job while chasing their curiosity. This infrastructure provides the support software for transporting information between repositories and desks. By facilitating data transport, central coordination of distributed activities becomes a reality, a first step at moving from 6 colleges to a single coherent university.

We have taken our first steps at building this infrastructure by implementing and deploying several critical tools (accessible from the IT lab web site, <http://www.itlab.musc.edu>):

- 1) mod_auth_any: A web based tool for coordinating authentication with a central authority, in our case, the email system
- 2) authentication gateway: A secure authentication tool for managing MUSCnet access from public areas and from wireless classrooms
- 3) mySiteMaker: A tool for building a browser-accessible interface around views of a database (mySQL, Sybase)
- 4) mySQLimport: A tool for uploading desktop files to a database
- 5) Jabber Services: A collection of tools for building workflow managers supporting submit, forward and approve document management (see <http://www.itlab.musc.edu/itlab/workflows.html>)
- 6) PhpESP: a general purpose survey tool

- 7) XML gateway: a tool for passing information between administrative systems, currently being developed to pass data and status information between UMS and SmartStream

The focus of our strategy is to enable every student, faculty and staff member to access information using simple web-accessible data transport tools we are building. The cost of this approach is a cultural shift from “let the IT group do it” to “I’ll do it myself”.

Information Technology Objectives Which Will Facilitate the President’s Goal:

We need to move MUSC from the paper-process or paper-phone-process age into the paperless-internet-process era. My goal is to develop an internet-based infrastructure to support access to and integration of information generated within the operating units of MUSC and move all of MUSC as one entity into the internet-process age. My immediate projects are to:

- 1) Create a communication infrastructure that permits working away from one’s desk as effectively as working at one’s desk. No one should be tied to their desk to get the day’s work done. Staff should be able to collect and enter information into a database or patient record or student record at the point of origin and be able to retrieve, evaluate, and manipulate these data as needed and where needed.
- 2) Package information from our databases into a portable format that can be transported via standard internet communication protocols. The key to portability lies in developing a general format applicable to all MUSC systems. Portability avoids construction of costly interfaces between pairs of systems. A little arithmetic reveals the importance of this. Lets say we have 20 systems – so the number of 2-way interfaces is $20 * 19 / 2 = 190$. The number of interfaces based on a commonly used portable format (e.g. XML) is 20; one interface between the internal format and the portable format. Clearly managing 20 interfaces to and from a portable format is cheaper than managing 190 interfaces. MyGrants and similar database access tools package data in either HTML (web display format), text file (suitable for importing into a desktop database), excel format (suitable for dumping data directly into an Excel spreadsheet) and XML (the international standard for packaging data for electronic interchange). Movement from migrants to any desktop application is trivial, and without special interfaces.
- 3) Build our mission critical support systems around industry standard databases that permit external access, via internationally accepted communication protocols, to internal data. Such access permits us to develop “application wrappers” that enable people to access information in a manner that was not anticipated in the original application. MyOaxis is an example of a web-based data extraction tool used by the transplant surgeons for moving clinical data into a research database. MySimon is an example of building a wrapper around our pager system that permits outside-MUSC access to the paging system for those with MUSC network accounts.

Accomplishments:

We have focused on analyzing the processes that facilitate getting the day's work done efficiently and effectively. We have analyzed the computing and communication infrastructure of the whole university, identified several major problems, and prototyped solutions for these problems from which we can either develop the solutions ourselves or procure externally written software that addresses our needs. We have learned that rapid prototyping improves our ability to articulate what the software should do, by providing the user with something that is tangible and that can be tried, and then successively refined.

Specifically we have:

- 1) Extended our sphere of influence to embrace off campus access to institutional resources. This has required expanding dial-up PPP services, developing VPN solutions for those with cable modem access and installing continuous realtime monitoring tools for managing the network.
- 2) Developed a tool for single authentication, access and security control.
- 3) Developed web-based access to previously inaccessible institutional databases.
- 4) Developed the concept of wrapper technology, which extends the utility of information collected by our financial, human resources, student and clinical systems.

To Do:

We must:

- 1) Identify and remove the cultural barriers to information handling that resist the changes necessary to consolidate the 6 autonomous colleges into one single dynamic university. Specifically, we have found resistance to sharing data across institutional boundaries. We need to reeducate our database managers so that they perceive themselves as "custodians" of data instead of "owners" of data. Examples of institutional databases which should be accessible by more than one college include Enrollment Services databases, Grants databases, Parking database, personnel database, aspects of the financial databases, telephone and pager databases. Opening up these databases to all colleges allows staff to extract information for local purposes without creating a shadow database.
- 2) Identify and remove the forces that spawn shadow databases (databases that repeat information already gathered elsewhere). We need to first identify institutional databases that contain shadow data and, second, employ tools that make it easier to access the needed information than to collect, maintain and manage a separate shadow system.
- 3) Train our end users to work in the internet age so that they can access information and generate reports themselves instead of relying on a third party (CCIT). In other words, we need to shift the burden of special report generation from CCIT to the end users.
- 4) Introduce new skill training for members of the MUSC family. End users must learn new skills in importing, exporting and processing data at the

desktop. Outside contractors assisting us with information management,(e.g., CCIT staff) must be able to develop web pages and manipulate databases that integrate with our new information management policies as well as generate new program applications. Similarly, our information technology coordinators (ITCs) should be continuously updated with respect to contemporary programming strategies.

Plan of Attack

Identify missing infrastructure components that impede rapid prototyping solutions to problems. Start with mission critical activities that impact revenue streams or have high support costs, and with a small team (me + an activity specialist + CCIT support specialist + IT Lab member) and analyze the sources and accessibility of information critical to the particular mission critical activity. Identify sources of errors, and where altered process can reduce errors. Prototype a web-accessible tool to implement a small scale trial of the reengineered process and evaluate. Targets would include:

- 1) Colleague student system; are 350 customizations necessary or do they reflect college specific constraints?
- 2) Personnel form – currently there is said to be a 70% error rate because its too complex
- 3) Moving tests for reimbursement as close as possible to the point of order entry
- 4) Coordinating of demographic information (MPI) among UMA, Carolina Family Care, and MUSC

An example of the utility of internet connectivity

As an example of how one might capitalize on internet connectivity, I've included some screen displays that illustrate a simple web interface to Medicare Fiscal Intermediary reimbursement policies, including links to CDC health databases and HCFA databases.

With a few lines of HTML code (that drives a web interface – here seen as the information within the “FRAMESET” tags) – we can create a 4 panel web page that links to Palmetto GBA part A, and part B, HCFA public use files and CDC downloads:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
<HTML>
<HEAD>
<TITLE>Frank's Medical Financial Reimbursement Stuff</TITLE>
</HEAD>

<FRAMESET ROWS="50%,*" COLS="50%,*">
<FRAME NAME="top_left"
SRC="http://www.palmettogba.com/palmetto/LMRPs_PartA.nsf/$$ViewTemplate+for+Final?ReadForm"
MARGINWIDTH="10" MARGINHEIGHT="10" SCROLLING="auto" FRAMEBORDER="0">
<FRAME NAME="top_right"
SRC="http://www.palmettogba.com/palmetto/LMRPs_PartB.nsf/$$ViewTemplate+for+Final?ReadForm"
MARGINWIDTH="10" MARGINHEIGHT="10" SCROLLING="auto" FRAMEBORDER="0">
<FRAME NAME="bottom_left" SRC="http://www.hcfa.gov/stats/pufiles.htm"
```

```

MARGINWIDTH="10" MARGINHEIGHT="10" SCROLLING="auto" FRAMEBORDER="0">
  <FRAME NAME="bottom_right"
SRC="ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/" MARGINWIDTH="10"
MARGINHEIGHT="10" SCROLLING="auto" FRAMEBORDER="0">
</FRAMESET>

```

```

<!-- Background white, links blue (unvisited), navy (visited), red (active) -->
<BODY BGCOLOR="#ddeece" TEXT="#000000" LINK="#0000FF"
  VLINK="#000080" ALINK="#FF0000" >
  <H1 ALIGN="CENTER">Medical Reimbursement Data Sources</H1>
  <P>

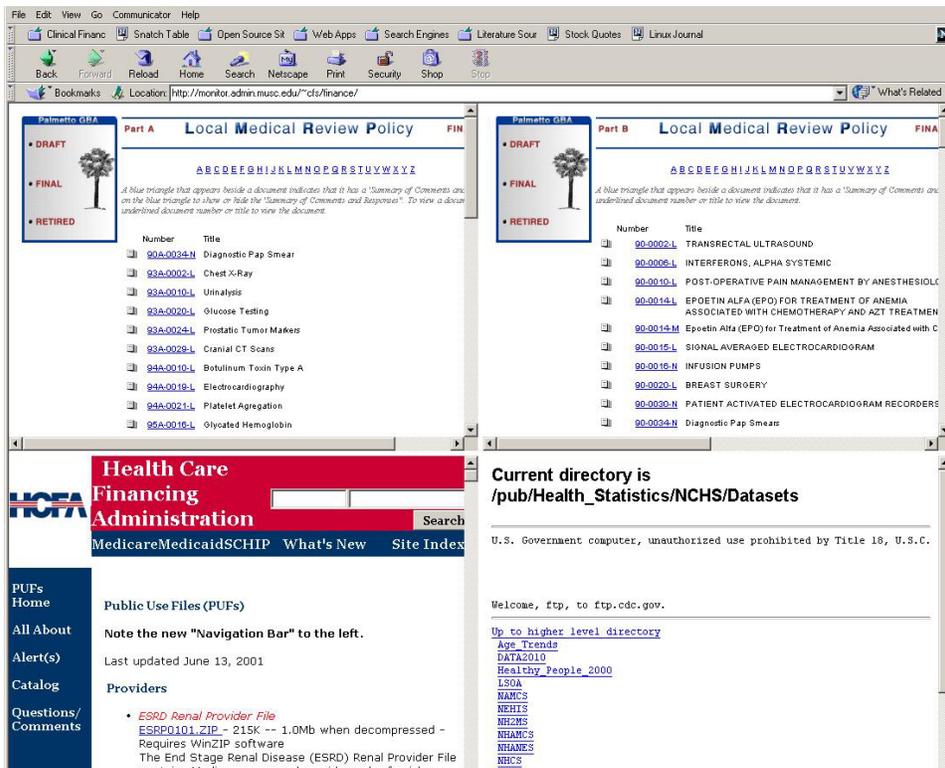
```

<p>
Here is a summary of web sources to get data to construct a CPT-ICD9-CM map.

```

</BODY>
</HTML>

```



From this, we can access the current CPT-ICD medical policies, build a database and potentially link it to an order-reimbursement process that provides a link of reimbursable diagnostic codes + “other”.

To build this database – we first access the policy:

REVENUE CODES

0311	Cytology
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INDICATIONS & LIMITATIONS

A diagnostic Pap smear and related medically necessary services are covered under Medicare Part B when ordered by a physician under one of the following conditions:

1. Previous cancer of the cervix, uterus, or vagina that has been or is presently being treated
2. Previous abnormal Pap smear
3. Any abnormal findings of the vagina, cervix, uterus, ovaries, or adnexa
4. Any significant complaint by the patient referable to the female reproductive system
5. Any signs or symptoms that might, in the physician's judgment, reasonably be related to a gynecologic disorder

NOTE: In reference to condition 5. (above), when a physician orders a Pap smear based on this reason, it will be left to the judgment of the intermediary to determine whether or not the test must be considered a diagnostic or screening Pap smear.

CPT CODES

88141	Cytopathology, cervical or vaginal (any reporting system); requiring interpretation by physician
88142	Cytopathology, cervical or vaginal (any reporting system), collected in preservative fluid, automated thin layer preparation; manual screening under physician supervision
88143	...With manual screening and rescreening under physician supervision
88144	...With manual screening and computer assisted rescreening under physician supervision
88145	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision
88147	Cytopathology smears, cervical or vaginal, screening by automated system under physician supervision
88148	...Screening by automated system with manual rescreening
88150	Cytopathology, slides, cervical or vaginal; manual screening under physician supervision
88152	...With manual screening and computer assisted rescreening under physician supervision
88153	...With manual screening and rescreening under physician supervision
88154	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision
88155	Cytopathology, slides, cervical or vaginal, definitive hormonal evaluation (eg, maturation index, karyopyknotic index, estrogenic index)
88164	Cytopathology, slides, cervical or vaginal (the Bethesda System); manual screening under physician supervision
88165	...With manual screening under physician supervision
88166	...With manual screening and computer assisted rescreening under physician supervision
88167	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision

We then extract the table from the web page, using table export

Select Tables to Export

Export All Tables As:

Text: MS-Excel

Export Only Selected Tables:

Table: (1,0)

Table: (0,0)

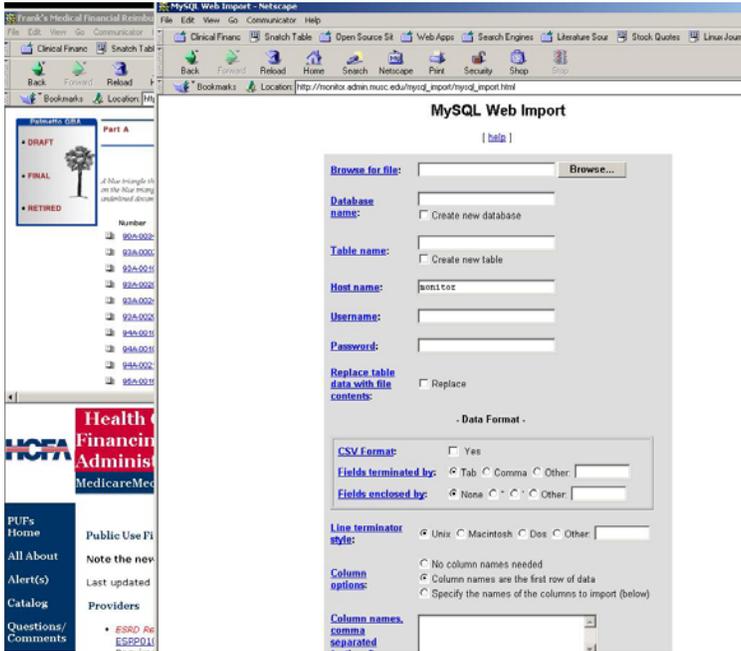
Table: (0,1)

0311 Cytology

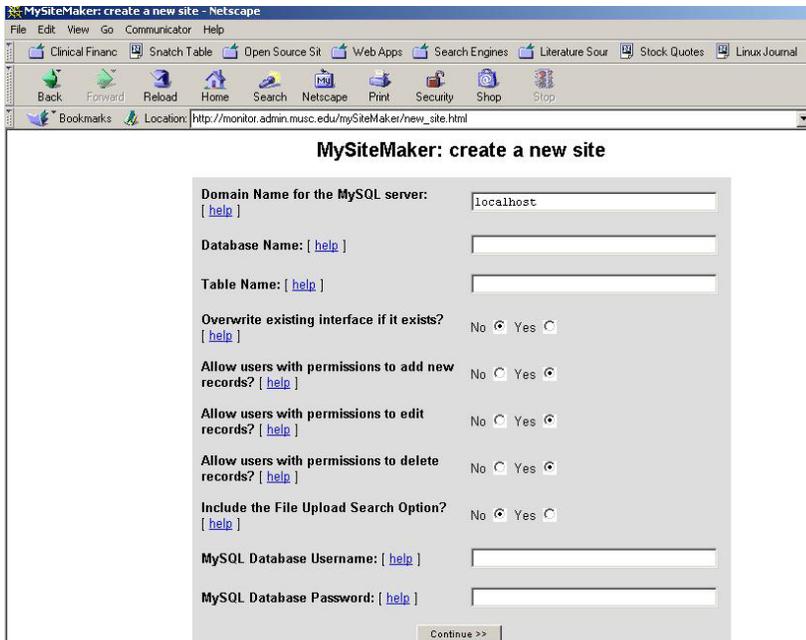
Table: (0,2)

88141	Cytopathology, cervical or vaginal (any reporting system); requiring interpretation by physician
88142	Cytopathology, cervical or vaginal (any reporting system), collected in preservative fluid, automated thin layer preparation; manual screening under physician supervision
88143	...With manual screening and rescreening under physician supervision
88144	...With manual screening and computer assisted rescreening under physician supervision
88145	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision
88147	Cytopathology smears, cervical or vaginal, screening by automated system under physician supervision
88148	...Screening by automated system with manual rescreening
88150	Cytopathology, slides, cervical or vaginal; manual screening under physician supervision
88152	...With manual screening and computer assisted rescreening under physician supervision
88153	...With manual screening and rescreening under physician supervision
88154	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision
88155	Cytopathology, slides, cervical or vaginal, definitive hormonal evaluation (eg, maturation index, karyopyknotic index, estrogenic index)
88164	Cytopathology, slides, cervical or vaginal (the Bethesda System); manual screening under physician supervision
88165	...With manual screening under physician supervision

We build a database with mysql_import



We then build the web interface:



And use the new web-interface to the database

The screenshot shows a Netscape browser window with the title "finance:cpt -- Search". The address bar shows the URL "http://monitor.admin.musc.edu/mySiteMaker/finance_cpt_search.html". The browser's toolbar includes buttons for Back, Forward, Reload, Home, Search, Netscape, Print, Security, Shop, and Stop. The main content area is titled "finance:cpt -- Search" and contains a search form with the following elements:

- A "[help]" link.
- A search criteria section: "Find records where:" followed by a dropdown menu set to "cpt_code" and a "contains" operator, with an empty text input field.
- A "- OR -" separator.
- A second search criteria section: "Find records where:" followed by a dropdown menu set to "cpt_code" and an "is in file:" operator, with an empty text input field and a "Browse..." button.
- An "Order by" section: "Order by" followed by a dropdown menu set to "cpt_code" and an "Ascending" sort order dropdown.
- A "Return results as" section: "Return results as" followed by a dropdown menu set to "HTML" and a "Limit HTML screens to" dropdown menu set to "25" records per screen.
- A "Columns to Show" section: "Columns to Show" followed by a dropdown menu set to "HTML", with a sub-menu showing options: "HTML", "MS Excel", "Text", and "XML".
- A checkbox labeled "Show column names." which is checked.
- A "Submit" button.
- A link labeled "Add a new record".

On the left side of the browser window, there is a sidebar with a "Palmetto GSA" logo and a "Part A" section containing a tree view with categories: "DRAFT", "FINAL", and "RETIRED". Below this is a list of numbers: 90A.000, 93A.000, 92A.001, 93A.002, 93A.002, 93A.002, 94A.001, 94A.001, 94A.002, 95A.001.

At the bottom left, there is a "Health Financ Adminis MedicareMe" logo and a navigation menu with links: "PUFs", "Home", "All About", "Alert(s)", "Catalog", "Questions/Comments".

At the bottom right, there is a footer: "Brought to you by the friendly folks at the [IT Lab](#)."

To access the data, as we search for specific information:

Search Results - Netscape

Query: SELECT cpt.cpt_code, cpt.description, cpt.cpt FROM cpt WHERE cpt_code like '%%%' ORDER BY cpt_code ASC LIMIT 0, 25
 Total Records found: 16
 Displaying Records: 1-16

Search within results where: contains Search

cpt_code	description	cpt
88141	Cytopathology, cervical or vaginal (any reporting system); requiring interpretation by physician	1
88142	Cytopathology, cervical or vaginal (any reporting system), collected in preservative fluid, automated thin layer preparation; manual screening under physician supervision	2
88143	...With manual screening and rescreening under physician supervision	3
88144	...With manual screening and computer assisted rescreening under physician supervision	4
88145	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision	5
88147	Cytopathology smears, cervical or vaginal; screening by automated system under physician supervision	6
88148	...Screening by automated system with manual rescreening	7
88150	Cytopathology, slides, cervical or vaginal; manual screening under physician supervision	8
88152	...With manual screening and computer assisted rescreening under physician supervision	9
88153	...With manual screening and rescreening under physician supervision	10
88154	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision	11
88155	Cytopathology, slides, cervical or vaginal, definitive hormonal evaluation (eg, maturation index, karyopyknotic index, estrogenic index)	12
88164	Cytopathology, slides, cervical or vaginal (the Bethesda System); manual screening under physician supervision	13
88165	...With manual screening under physician supervision	14
88166	...With manual screening and computer assisted rescreening under physician supervision	15
88167	...With manual screening and computer assisted rescreening using cell selection and review under physician supervision	16

[Add a new record](#)

Then its possible to do all the things we do with mygrants:

The screenshot shows the myGrants website interface. The main content area includes a search section with the following elements:

- Find records in:** Public Grants
- where:** Last Name is []
- Date Range (optional):**
 - Period: Current Begin Date is on or after [] YYYY-MM-DD
 - Period: Current End Date is on or before [] YYYY-MM-DD
 - Active grants as of: [] YYYY-MM-DD
- Formatting:**
 - Order by: Agency Ascending
 - Return results as: HTML (selected), Text, MS Excel, XML
 - Options: Show column, Repeat, Show link to email corrections (HTML output only, requires MNA/password).
 - Fields to Show: All
- Upload Search File:** where Last Name is in file [] Browse... Order by this field.
- Required for access to Pending Grants or to submit corrections:** MNA User: [] Password: []
- Submit:** Last updated: Tue Jun 26 15:18:41 EDT 2001

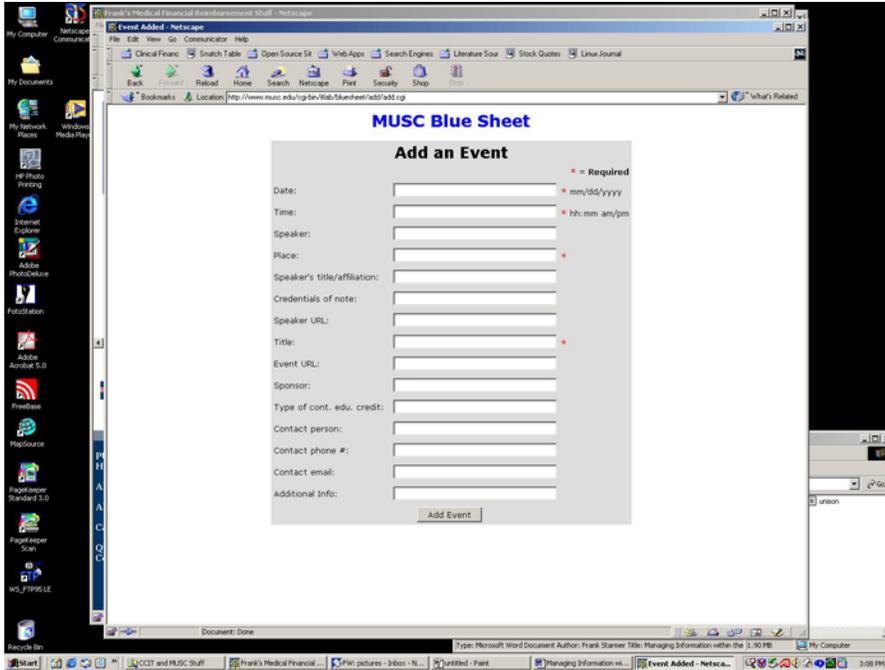
The left sidebar contains navigation links: PUFs, Home, All About, Alert(s), Catalog, Questions/Comments, Public Use F, Note the new, Last updated, Providers, and a list of ESRD and ESRP01.

Dumping data into an excel spreadsheet

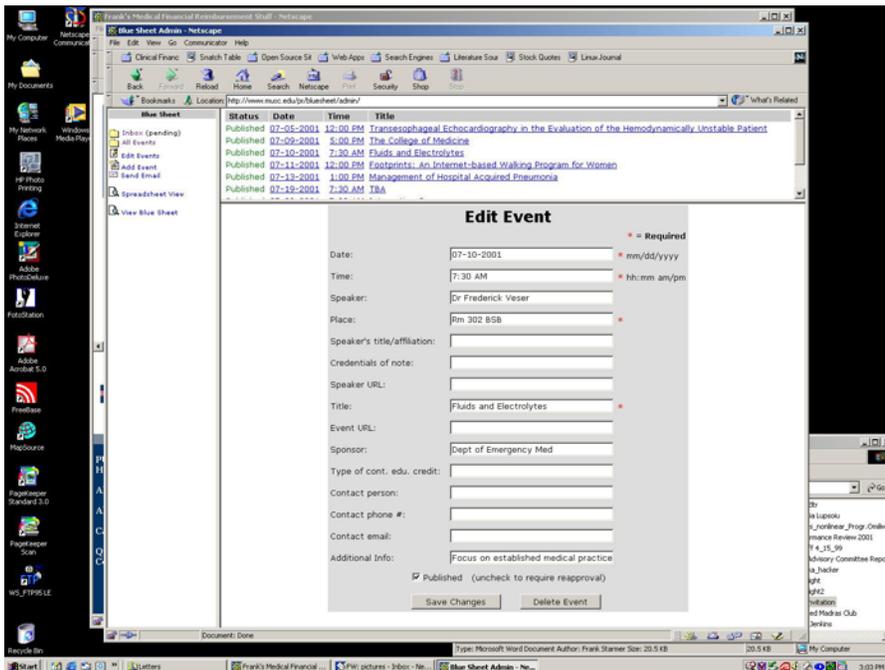
The screenshot shows the myGrants website search results for 'crouch' being exported to a Microsoft Excel spreadsheet. The spreadsheet displays a table with columns for grant number, name, department, and project title.

Grant Number	Name	Department	Project Title
1020606	ROSAJIE CROUCH	Ophthalmology	Laser Damage to the Retina and Retinal Pigment Ep
9407108	ROSAJIE CROUCH	Ophthalmology	Molecular Mechanisms Controlling Proton Pumping #
96013000	ROSAJIE CROUCH	Ophthalmology	Molecular Mechanisms Controlling Proton Pumping #
97021302	ROSAJIE CROUCH	Ophthalmology	Molecular Mechanisms Controlling Proton Pumping #
62628	ROSAJIE CROUCH	Ophthalmology	FOUNDATION FIGHTING BLINDNESS Visual Transduction in Rods and Cones
98046003	ROSAJIE CROUCH	Ophthalmology	NIHNCRR 1 S10 R913682-01
99003005	ROSAJIE CROUCH	Academic Affairs / Provo	NIHNCRR 1 C06 R914516-01
22970	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-01
302028	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-10
302181	ROSAJIE CROUCH	Ophthalmology	NIHNEI 2 R01 EY04939-11
94052001	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-12
94052001	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-12
96051202	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-13
96072305	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-14
96072306	ROSAJIE CROUCH	Ophthalmology	NIHNEI 2 R01 EY04939-15
96072306	ROSAJIE CROUCH	Ophthalmology	NIHNEI 2 R01 EY04939-15
96085010	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-16
96085010	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-16
99052601	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-17
99052601	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-17
61209	ROSAJIE CROUCH	Ophthalmology	NIHNEI 5 R01 EY04939-18
301602	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-00
302522	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-00
93111501	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-10
94020413	ROSAJIE CROUCH	Ophthalmology	NIHND0H-2 T35 Dk07431-11
96011000	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-12
96111902	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-13
97111801	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-14
98111803	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-15
99111803	ROSAJIE CROUCH	Ophthalmology	NIHND0H-5 T35 Dk07431-16

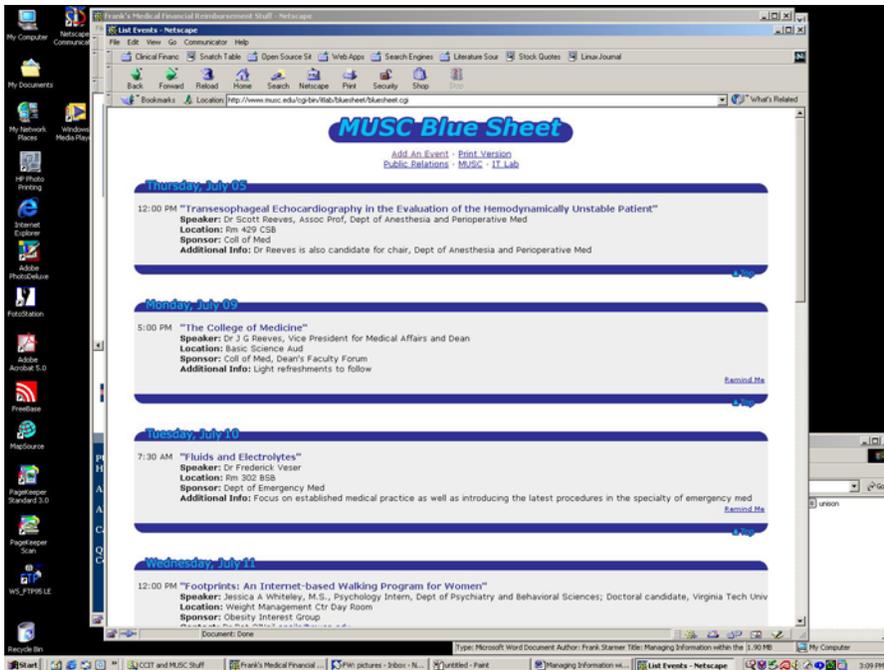
This takes care of the database extract, cut and paste side of the equation, but what about data entry, forms submission etc. Here we have developed a workflow manager, that behaves like an email system. With a browser, you point to the form of interest, and in this example it's the seminar notice form:



When the event notice is submitted, it appears in the workflow manager, coordinated by PR:



Where the event is edited and finally saved. The result is a database of events that is available to create a printed Bluesheet – as well as create a content box for myMUSC.



Finally - for all of MUSC - we can build a personal portal to MUSC resources - called <http://my.musc.edu> which puts my frequently used stuff, 1 click away

