Going Paperless in Radiation Therapy

Nick Koch, PhD
Associate Professor
Medical University of South Carolina
Charleston, SC

Conflicts of interest

- None

Acknowledgments

- Jay Callahan, IT guru
- Kim Gadsden, RN
- Ingrid Marshall, PhD
- Ken Vanek, PhD

Paper charts

We know the future is paperless.

Depiction of the 23rd century's paperless environment in the 1966 *Star Trek* TV series.

http://www.peterbryer.com/2011/09/who-invented-tablet.html

Learning objectives

- Be familiar with the common motivations and challenges to implementation of EHR
- View the implementation of EHR through the lens of Robert's theory on the diffusion of innovation
- Be familiar with the variety of tools and means used to create a paperless environment

Outline

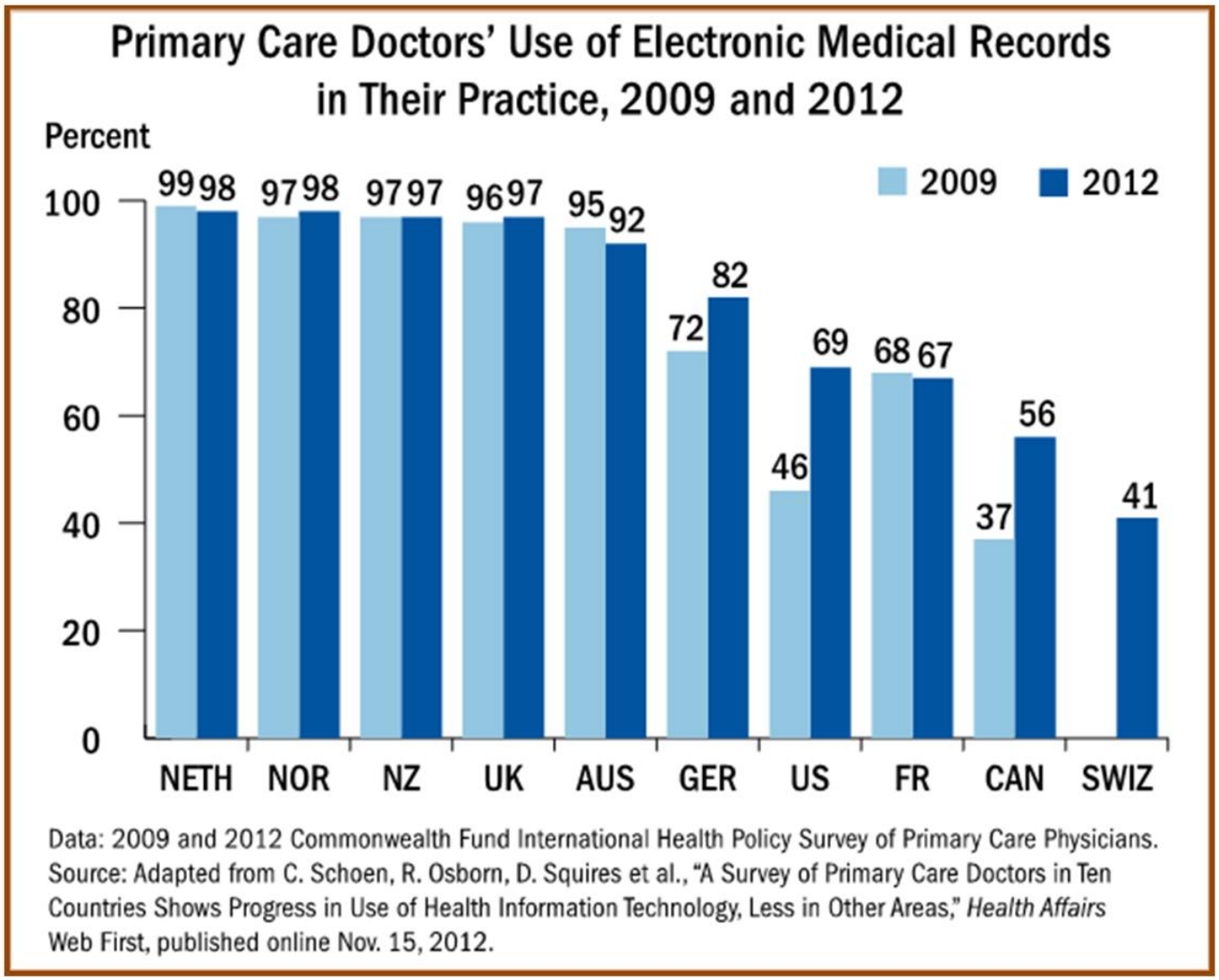
- The motivators behind EMR
- Challenges in adoption of EMR
- Examples of how MUSC went paperless
- Current works in progress in our wired/paperless clinic

Does your clinic currently use electronic treatment charts (not paper charts)?

Audience Response Instructions

Yes

No



http://www.commonwealthfund.org/News/News-Releases/2012/Nov/International-Survey.aspx

Incentives for converting to EHR

- Potential for:
  - Improving quality and safety
  - Increased accessibility of information
- HITECH Act of 2009
  - Financial gain
  - Avoiding financial loss

HITECH Act of 2009

- Authorized CMS to offer incentives to providers for adoption of EHR
  - Prove more meaningful use than an electronic version of a paper chart
    - Must satisfy "meaningful use" (MU) criteria
  - Stage 1 of incentive program (years 1 & 2)
    - Demonstrate 18 objectives and 6 clinical quality measures (CQM)
  - Stage 2 (year 3)
    - Demonstrate 20 objectives and 9 CQMs

Examples of MU criteria

Record Smoking Status	Record smoking status for patient 13 years old or older.		**Medication Allergy List**	Maintain active allergy list
Drug Interaction Checks	Implement drug-drug and drug-allergy interaction checks.		**Electronic Copy of Health Information**	Provide patients with an electronic copy of their health information upon request
e-Prescribing (eRx)	Generate and transmit permissible prescriptions electronically (eRx).		**Clinical Summaries**	Provide clinical summaries for patients for each office visit.

Adapted from https://www.astro.org/Practice-Management/EHR-Incentive-Program/Index.aspx

The Carrot…

Payment by Reporting Period	Year Meaningful Use First Demonstrated				
	2011	2012	2013	2014	2015 and Beyond
2011 Payment	$18,000				
2012 Payment	$12,000	$18,000			
2013 Payment	$8,000	$12,000	$15,000		
2014 Payment	$4,000	$8,000	$12,000	**$12,000**	
2015 Payment	$2,000	$4,000	$8,000	**$8,000**	**$0**
2016 Payment	---	$2,000	$4,000	**$4,000**	**$0**
Total Payment	$44,000	$44,000	$39,000	**$24,000**	**$0**

Adapted from https://www.astro.org/Practice-Management/EHR-Incentive-Program/Index.aspx

HITECH Act of 2009

- Mandatory reductions in Medicare payments starting in 2015 if MU criteria not met
- Payment adjustments are cumulative for every year "meaningful use" is not certified

…and the stick

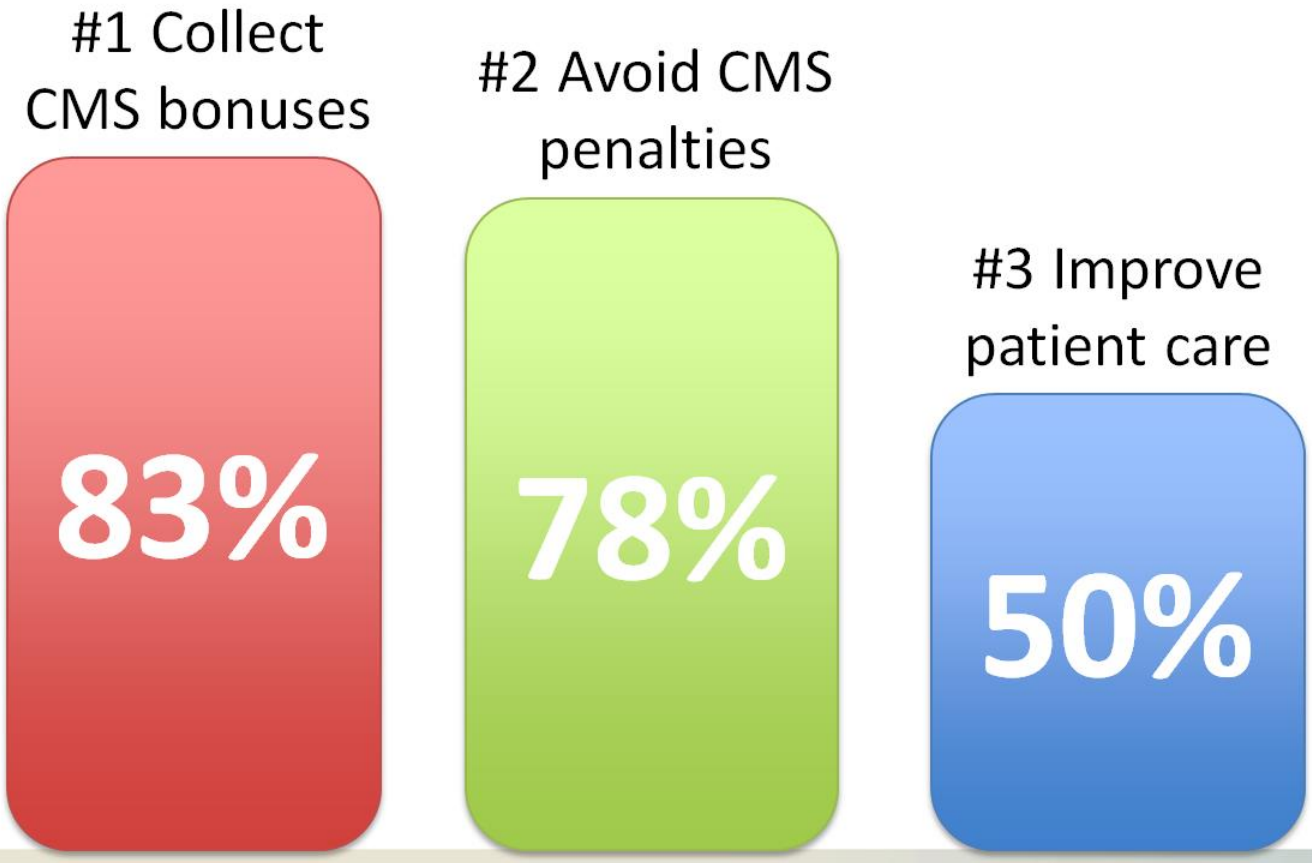
Reporting Year	Adjustment Year	Medicare Reimbursement Adjustment Percentage
2013/2014*	2015	-1%
2014	2016	-2%
2015	2017	-3%
2016	2018	-4%
2017	2019	-5%

*Must attest by Oct. 1 to avoid penalty in 2015, meaning 90-days EMR reporting period must begin no later than July 1, 2014

Photo credit: http://www.flickr.com/photos/59937401@N07/

Table adapted from https://www.astro.org/Practice-Management/EHR-Incentive-Program/Index.aspx

Top reasons to implement EMR



Changing What's Possible

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Shen et al. 2012

T/F: My clinic has no plans to go paperless in the future?

Audience Response Instructions

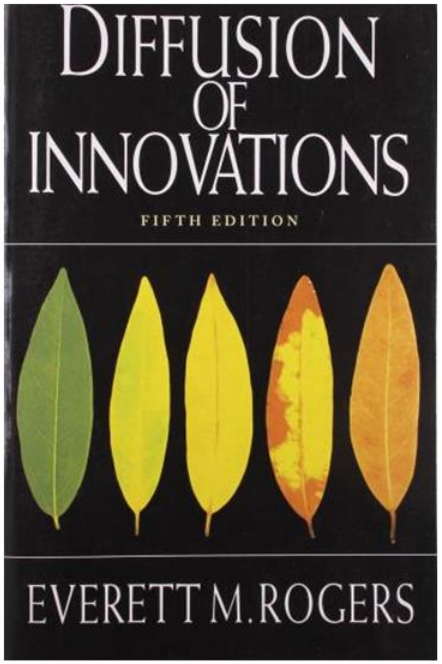
True

False

What's keeping you from joining the bandwagon

CHALLENGES AND BARRIERS

http://warroomsports.com/blog/wp-content/uploads/2010/10/Bandwagon-Stop.bmp



Changing What's Possible

http://en.wikipedia.org/wiki/Diffusion_of_innovations

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Stages of the adoption process

Stage	Definition
Knowledge	Exposed to the idea of EMR; lacks needed information; not inspired to seek more information
Persuasion	Become interested in EMR; seek needed information and resources
Decision	Decide whether to accept or reject EMR on an individual basis; personal cost/benefit analysis
Implementation	EMR implemented to varying degrees; usefulness of EMR may be personally evaluated and additional information sought
Confirmation	Final decision to continue using EMR as the "right" decision; EMR becomes standard practice

Knowledge and resources

- Shen et al. surveyed 21 RadOnc facilities
  - Hypothesis: lack of knowledge and resources are the rate-limiting steps in adopting MU criteria for EMR systems
  - Surveyed about:
    - Quality and safety
    - Factors of importance to implementation

Most important barriers to implementation

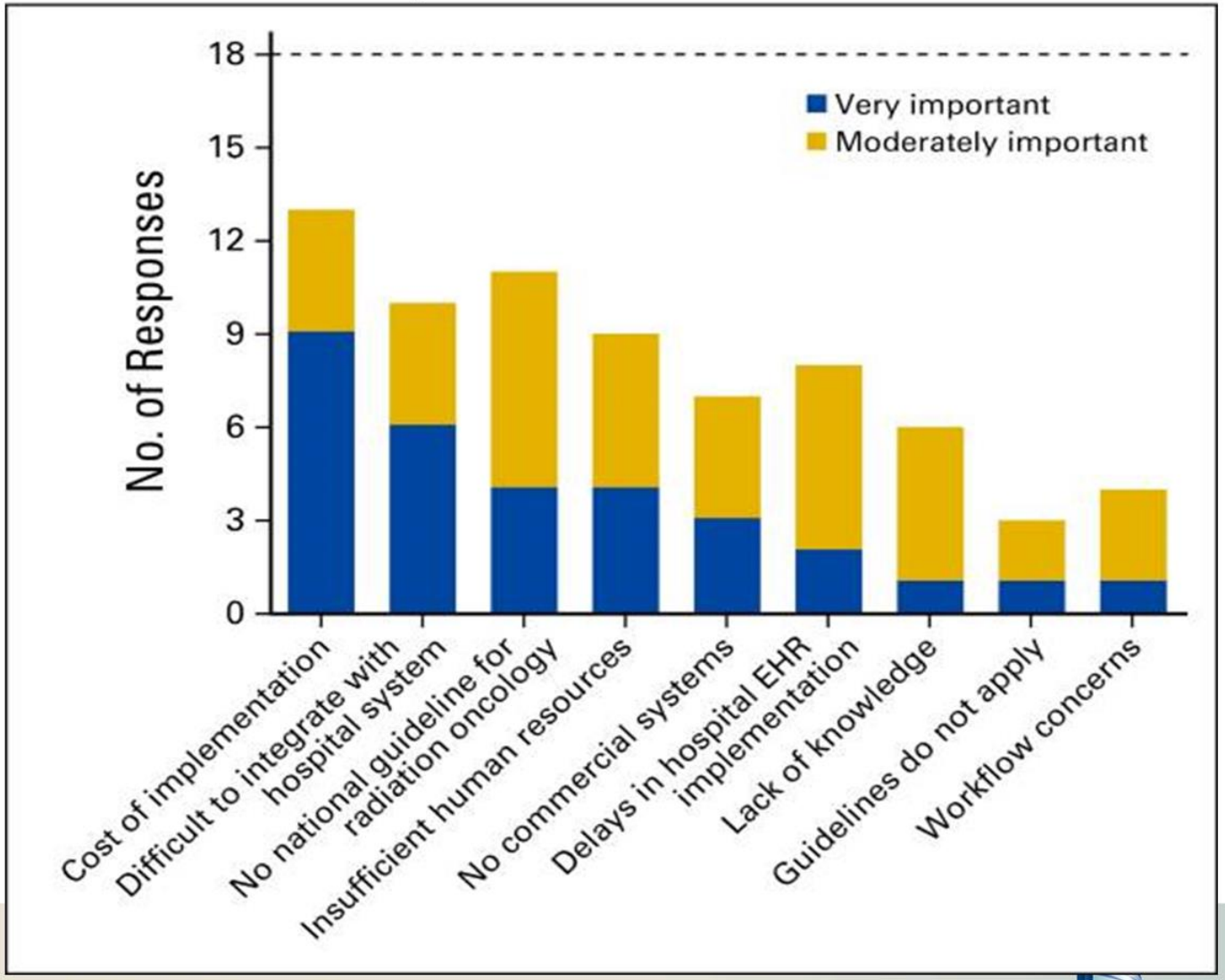


Figure from Shen et al. 2012

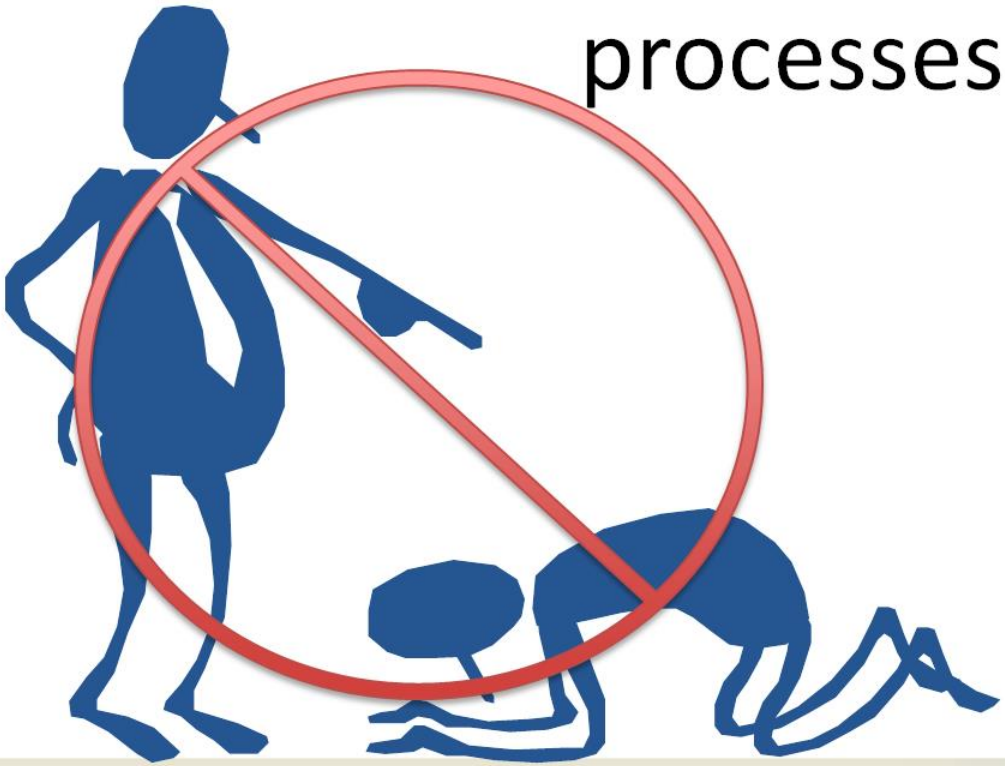
Perception of quality and safety

- 71% - EMR improves safety and quality
  - Remaining 29% “unsure”
- Gains cited in
  - Improved documentation
  - Reduced treatment errors
  - Reduced medication errors

Shen et al. 2012 & Harshberger et al. 2011

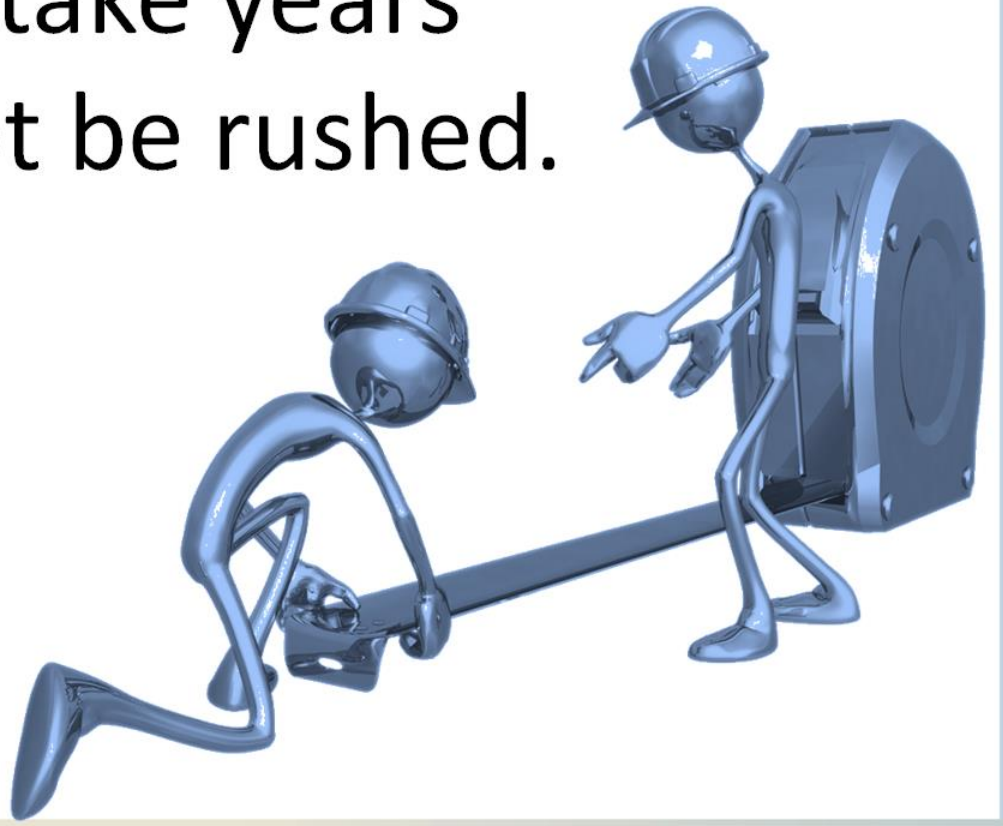
HIGH LEVEL TIPS FOR GOING PAPERLESS

Governance matters: end users must have a choice in designing and implementing processes affecting their work.



Simon et al. 2013

Measure twice, cut once: preparation and advanced planning may take years and should not be rushed.



Simon et al. 2013

Have in-person support available on “go-live” date or as major transitions occur.

Support at the elbow

Simon et al. 2013

The paradigm is shifting. Leadership should be aware of concerns and address them promptly.

Simon et al. 2013

The paradigm is shifting. Leadership should address concerns promptly to keep stakeholders focused.

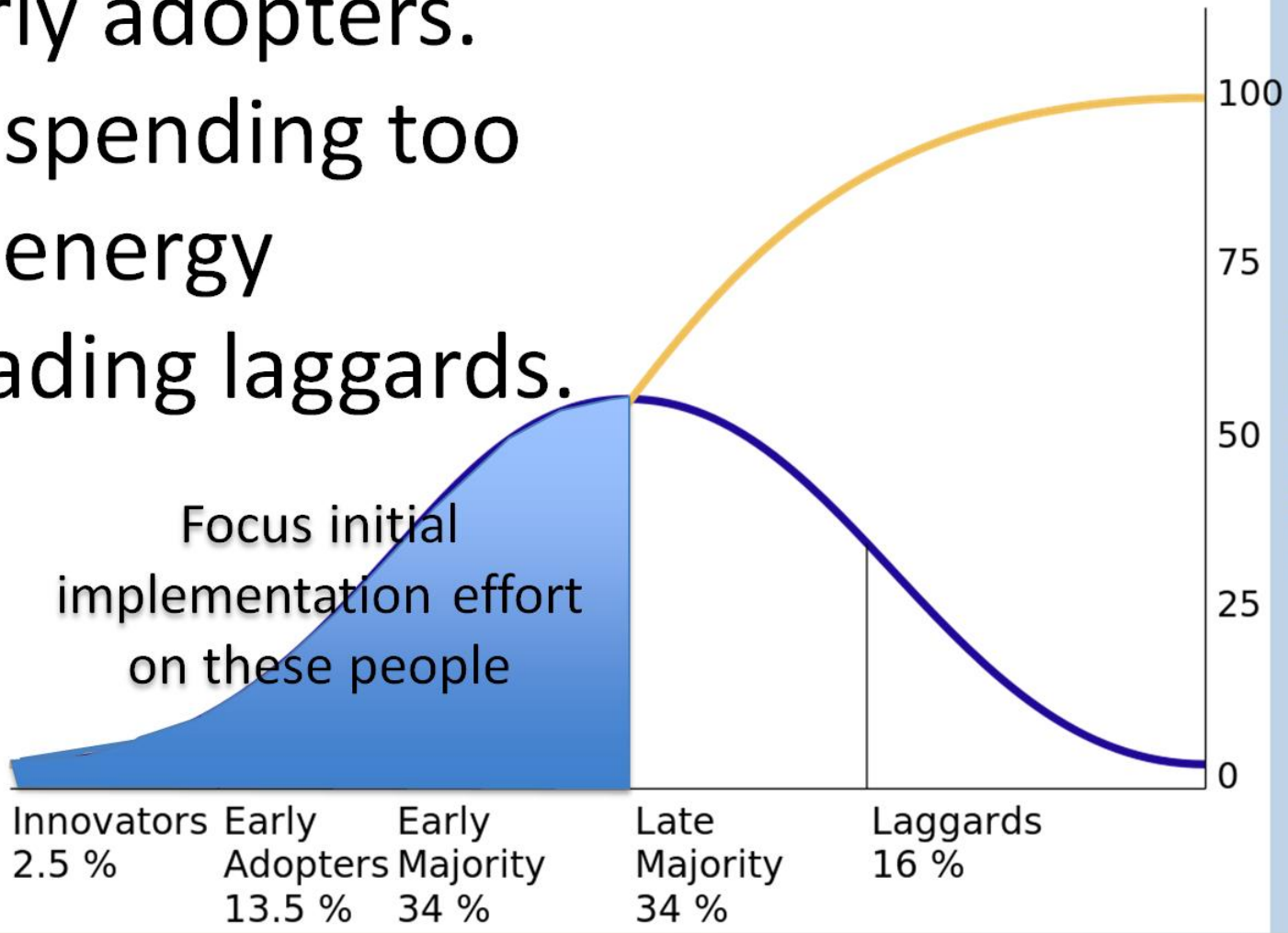
Simon et al. 2013

Prepare to address the dominos that fall once EHR is implemented. Have a plan to address these consequences.

Simon et al. 2013

PRACTICAL TIPS FOR GOING PAPERLESS

Focus your initial effort on early adopters. Avoid spending too much energy persuading laggards.



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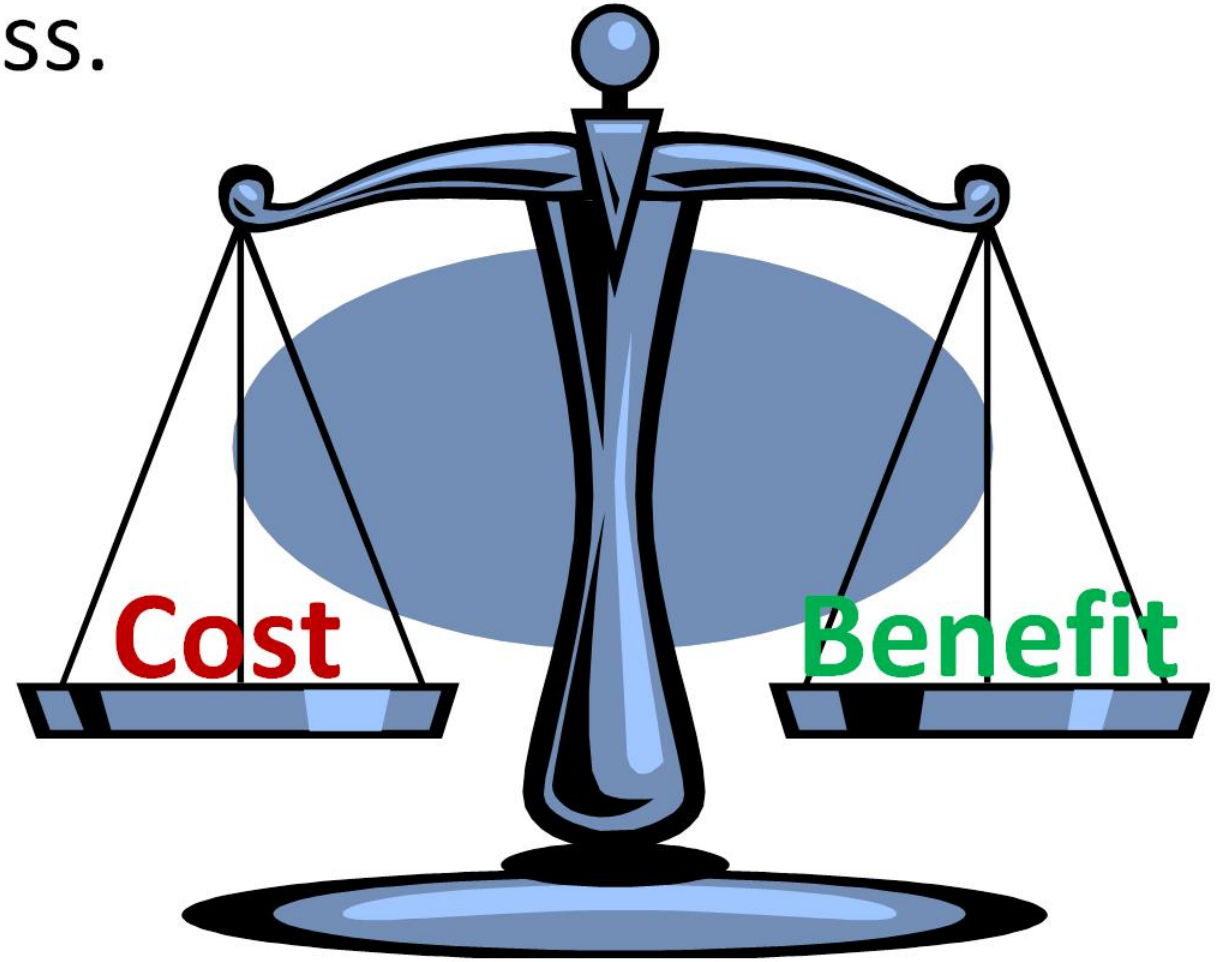
Adopted from: http://en.wikipedia.org/wiki/Diffusion_of_innovations

Quickly get some wins to build momentum.

Make it compatible to make it painless.

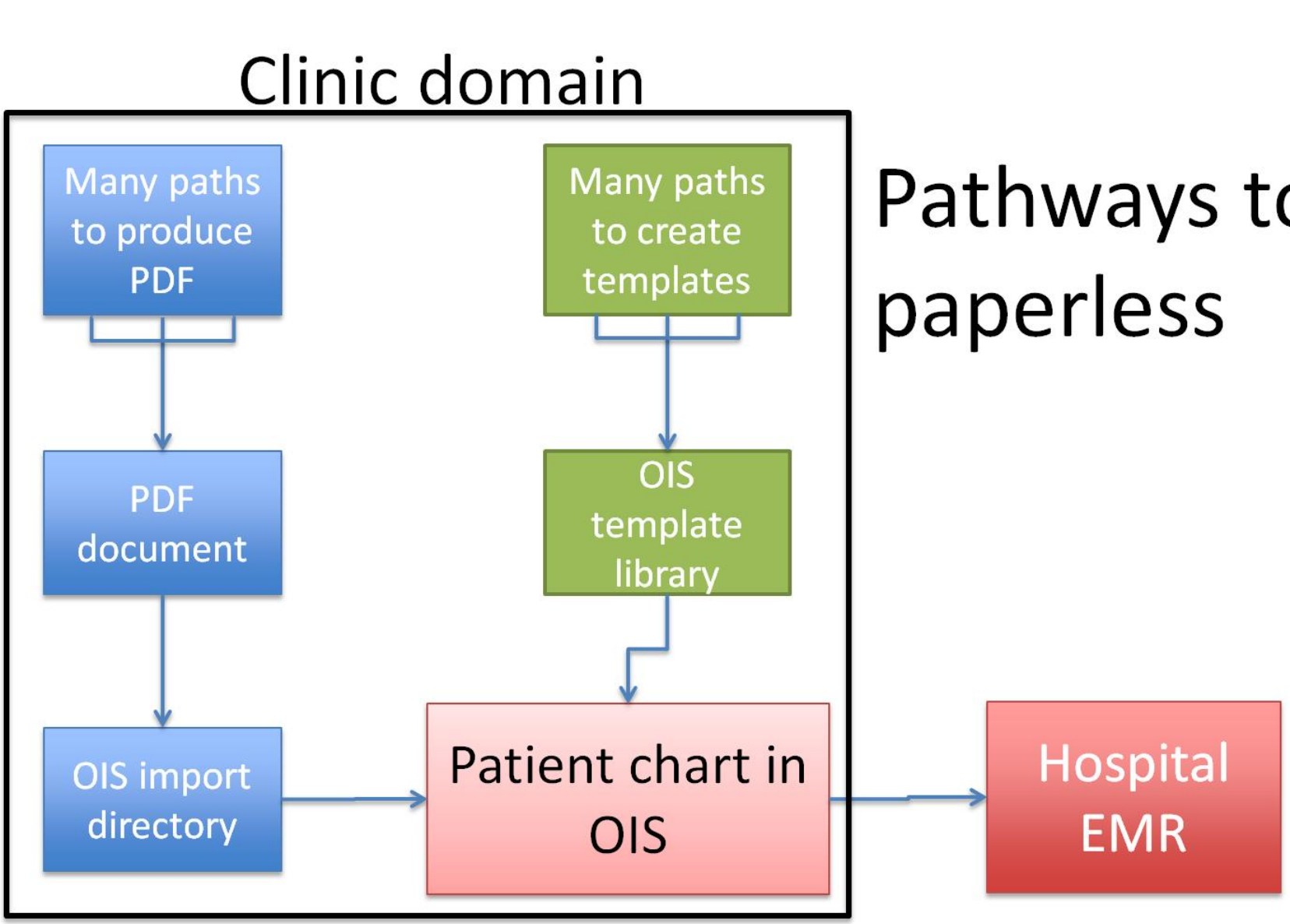


What has been your experience?

User-friendly EHR review

- 6 medical residents & 6 nurses with iPADs
  - Limited computers in exam rooms
  - Use of Win8 tablet currently being tested
- Dual monitors at workstations for physicists, physicians, and dosimetrists

Pathways to paperless



PINNACLE

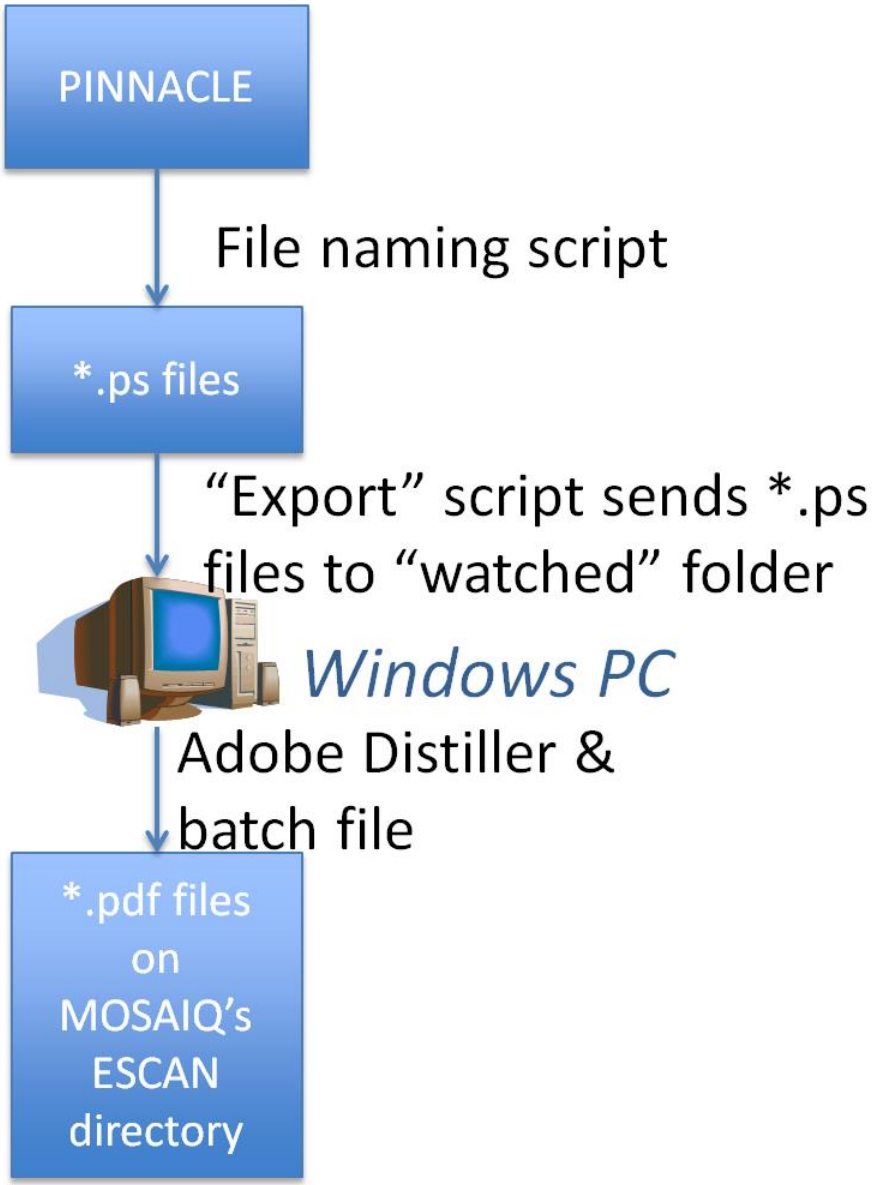
PRODUCING PAPERLESS RT-PLAN DOCUMENTATION

PINNACLE and the PDF

- PDF is a widely used format for document archiving
- PINNACLE lacks a native PDF printer
  - ECLIPSE v11 does as well
- How can one archive treatment plans in PDF format from PINNACLE?

Several solutions for PINNACLE users available online

- No need to reinvent the wheel
- Search “PDF” on www.medphysfiles.com
- MUSC’s PDF printing process was adapted from Nathan Childress’ upload


PINNACLE
File naming script
*.ps files
"Export" script sends *.ps files to "watched" folder
Windows PC
Adobe Distiller & batch file
*.pdf files on MOSAIQ's ESCAN directory

PINNACLE

File naming script

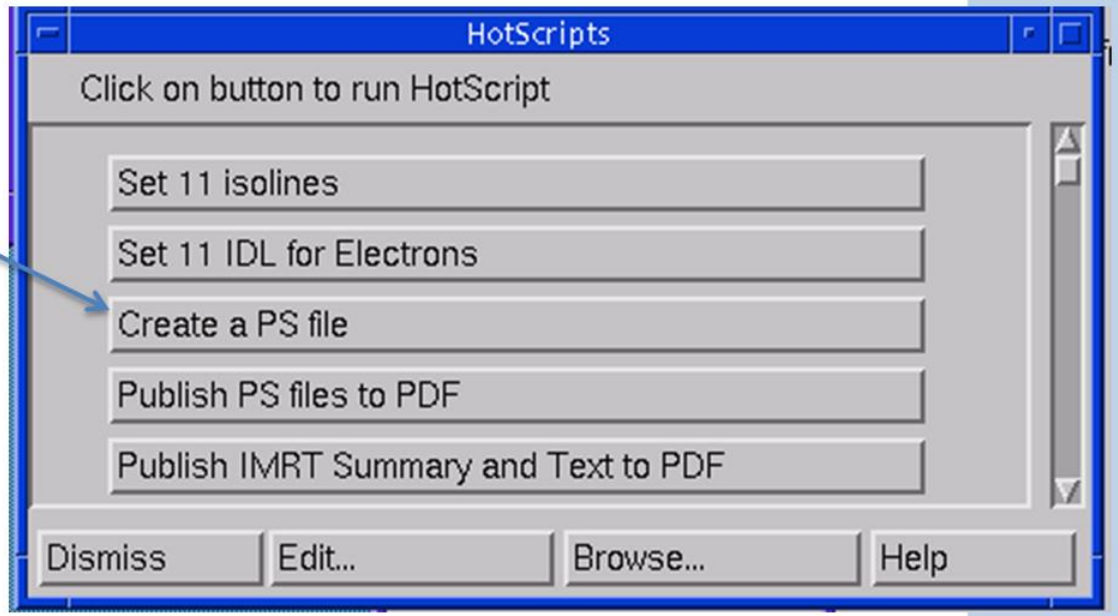
*.ps files

Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & .bat file

*.pdf files on MOSAIQ's ESCAN directory



PINNACLE

File naming script

*.ps files

Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

*.pdf files on MOSAIQ's ESCAN directory

```
WarningMessage = "Provide a unique filename, then proceed with
printing to file. Do not alter the MRN in the filename.";

Store.FreeAt.TempPS = "";
Store.At.TempPS = SimpleString{};
Store.At.TempPS.AppendString = "/home/p3rtp/Plans/";
Store.At.TempPS.AppendString = PlanInfo.MedicalRecordNumber;
Store.At.TempPS.AppendString = "-";
Store.At.TempPS.AppendString = PlanInfo.PatientName;
Store.At.TempPS.AppendString = "-.ps";

ColorPrinterControl.WindowDumpSelectionMethod.LongName = "Click
on window to be printed.";
ColorPrinterControl.PrintToFile = 1;
ColorPrinterControl.PrintToFilePaperSize = "Letter";
ColorPrinterControl.PrintToFileFileList.File = Store.At.TempPS.String;
WindowList .WindowPrint .Create = "Print Window...";
WindowList .ColorPrinterSelection .Create = "Select Printer...";
```

Example filename:
987654321-Smith-.ps

Make filename unique by adding a descriptor here for each page printed.

PINNACLE

File naming script

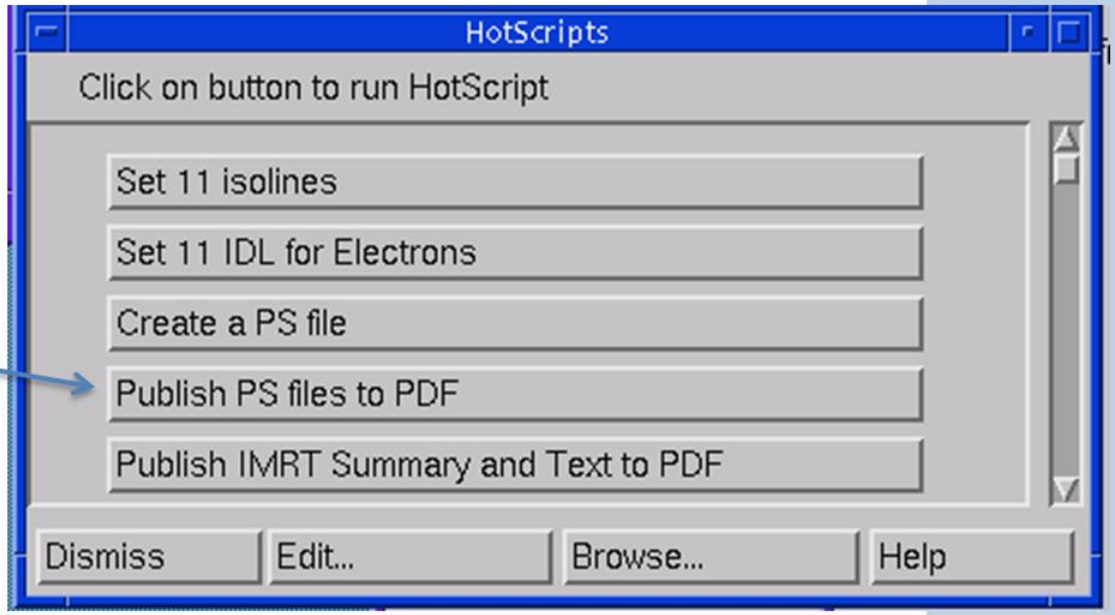
*.ps files

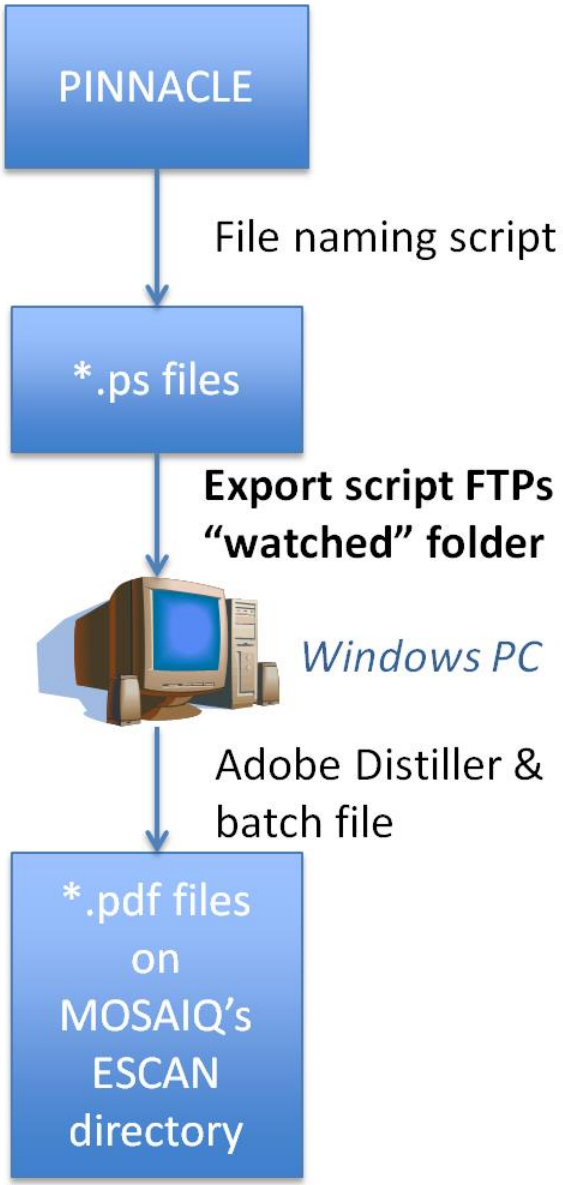
Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

*.pdf files on MOSAIQ's ESCAN directory





A unix script moves the *.ps files from the PINNACLE system to the WINDOWS PC via FTP.

```
#!/bin/sh
# FTPs all PS files to a server
UserName=p3rtp
Password=p3rtp
echo "open WINDOWS PC IP ADDRESS\n
      user $UserName $Password\n
      bin\n prompt off\n
      lcd /home/p3rtp/Plans\n
      mput *.ps\n bye\n" | ftp -nvi
```

PINNACLE

File naming script

*.ps files

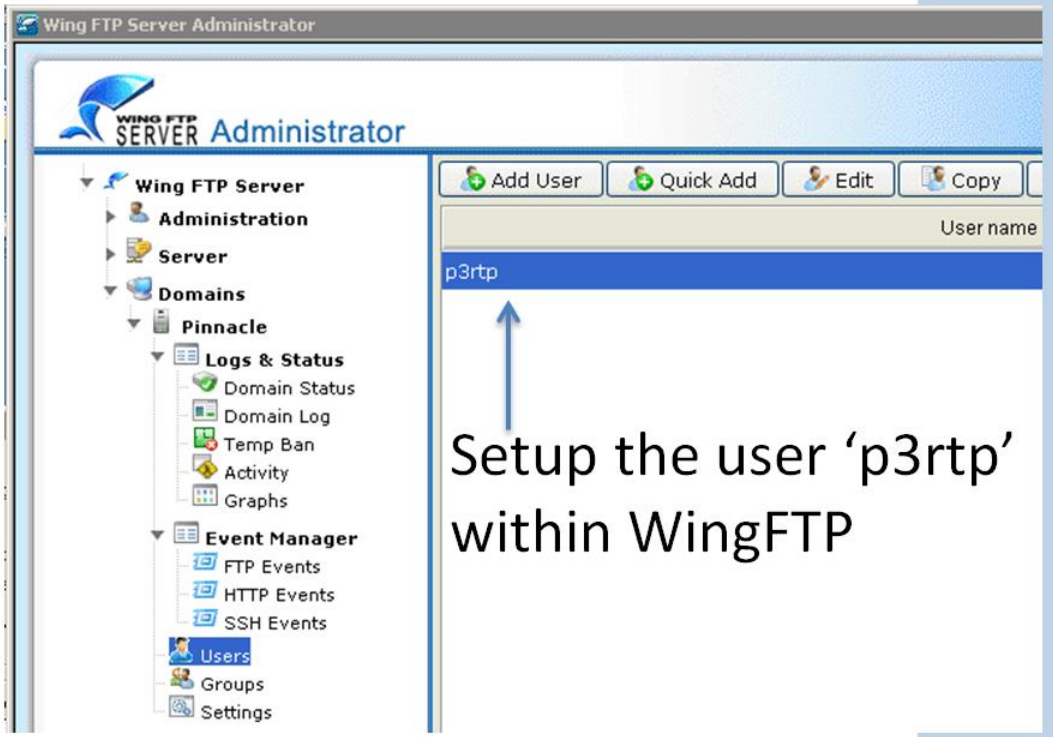
Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

*.pdf files on MOSAIQ's ESCAN directory

We use WingFTP Server as our FTP Service



Setup the user 'p3rtp' within WingFTP

PINNACLE

File naming script

*.ps files

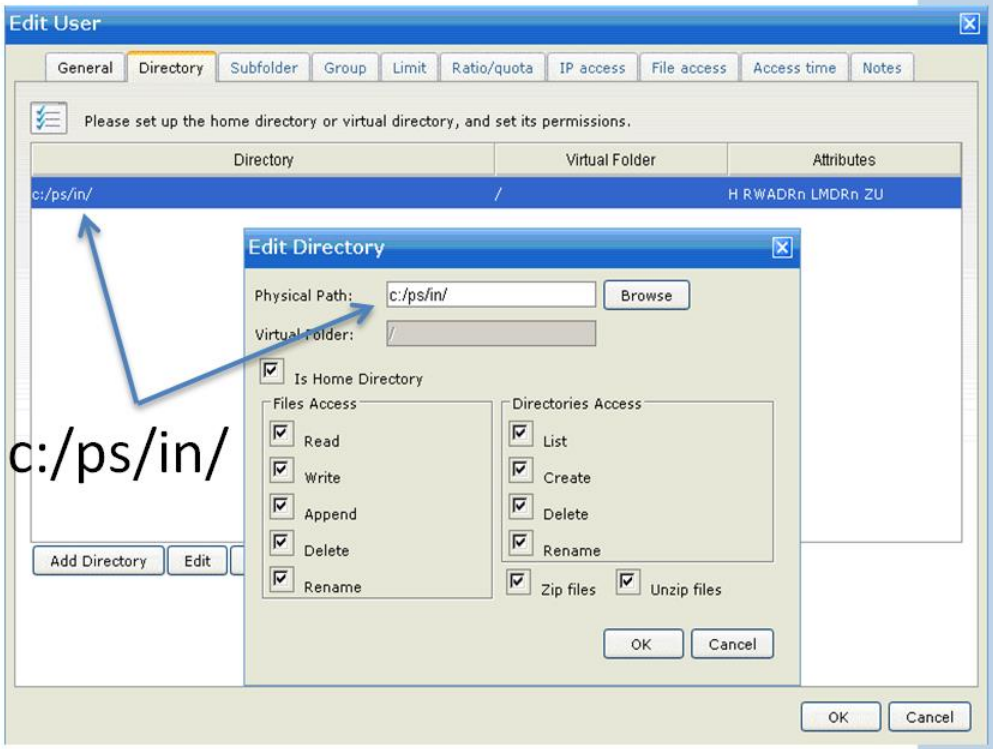
Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

*.pdf files on MOSAIQ's ESCAN directory

Specify the home directory of the WingFTP user 'p3rtp'



Setup "C:\PS" as a watched folder in Adobe Distiller

PINNACLE

File naming script

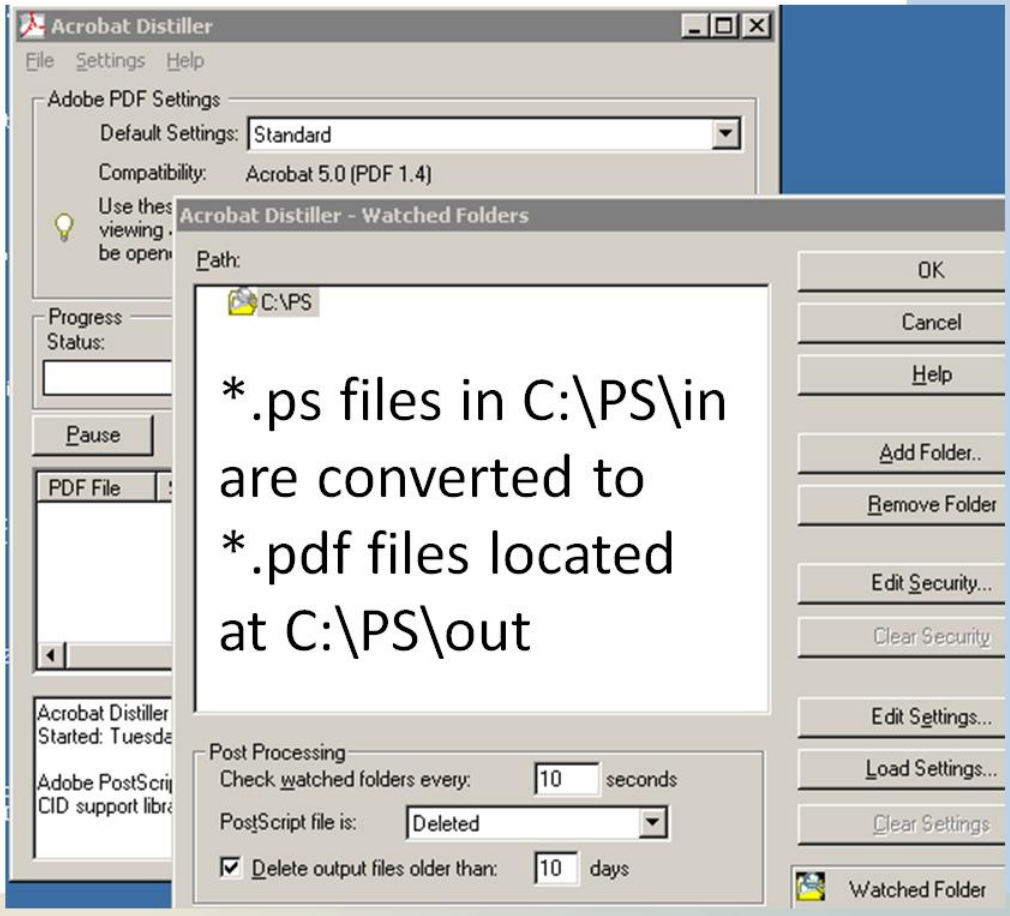
*.ps files

Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

*.pdf files on MOSAIQ's ESCAN directory



Create a batch (*.bat) file to move new PDF files to ESCAN directory

PINNACLE

File naming script

*.ps files

Export script FTPs to "watched" folder

Windows PC

Adobe Distiller & batch file

***.pdf files on MOSAIQ's ESCAN directory**

Batch file contains 2 lines:

@ECHO OFF
Move /Y c:\ps\out*.pdf *your path here*\escan

Distiller creates *.pdf files here

PINNACLE

File naming script

*.ps files

Export script FTPs to "watched" folder

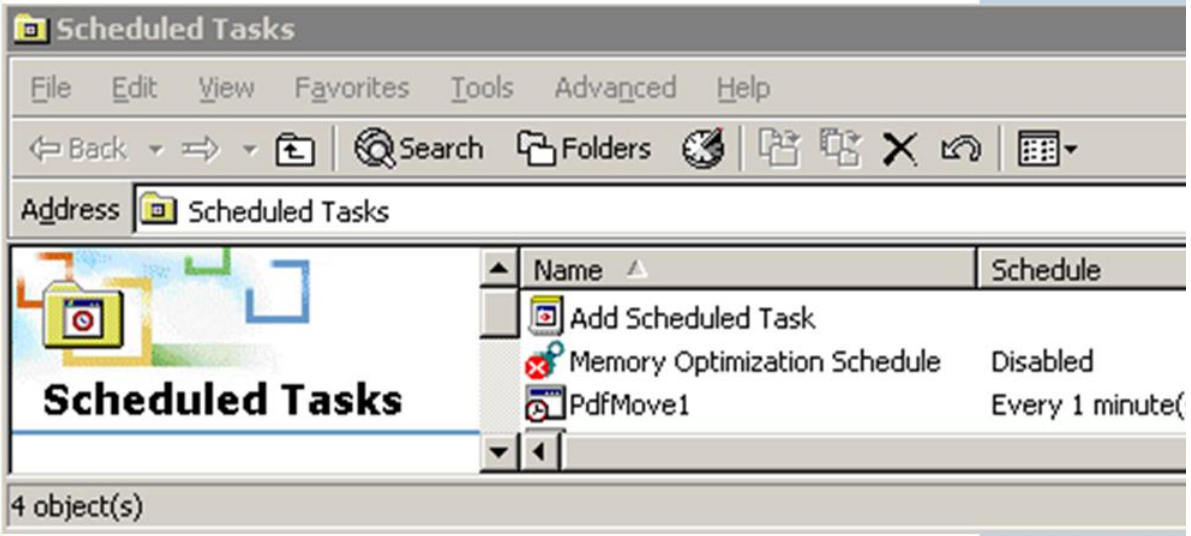
Windows PC

Adobe Distiller & batch file

***.pdf files on MOSAIQ's ESCAN directory**

Create a batch (*.bat) file to move *.pdf files to ESCAN directory

Schedule the batch file to run every minute…

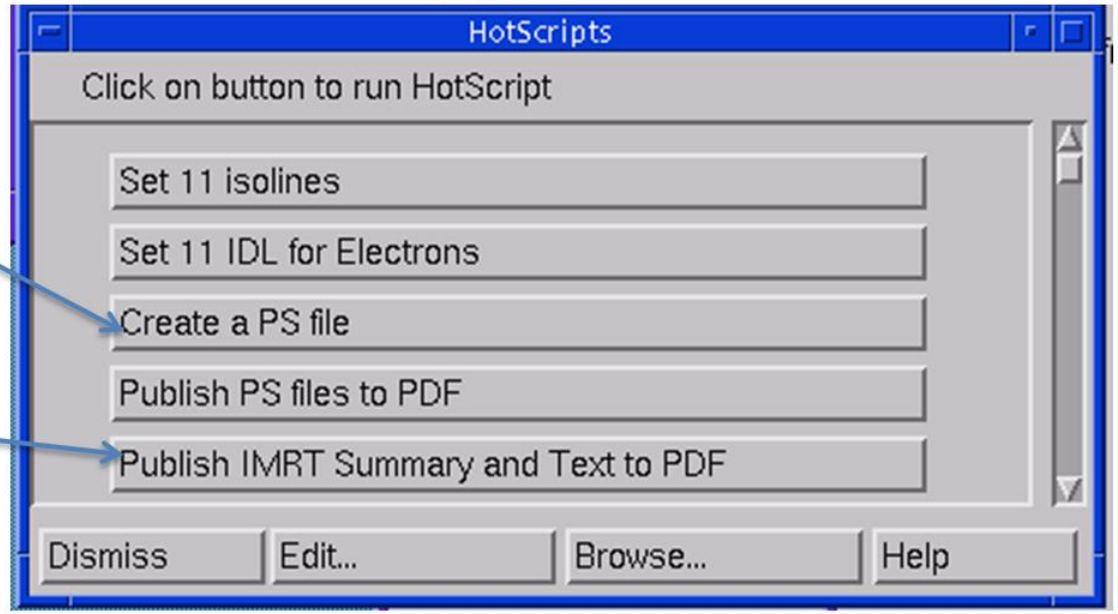


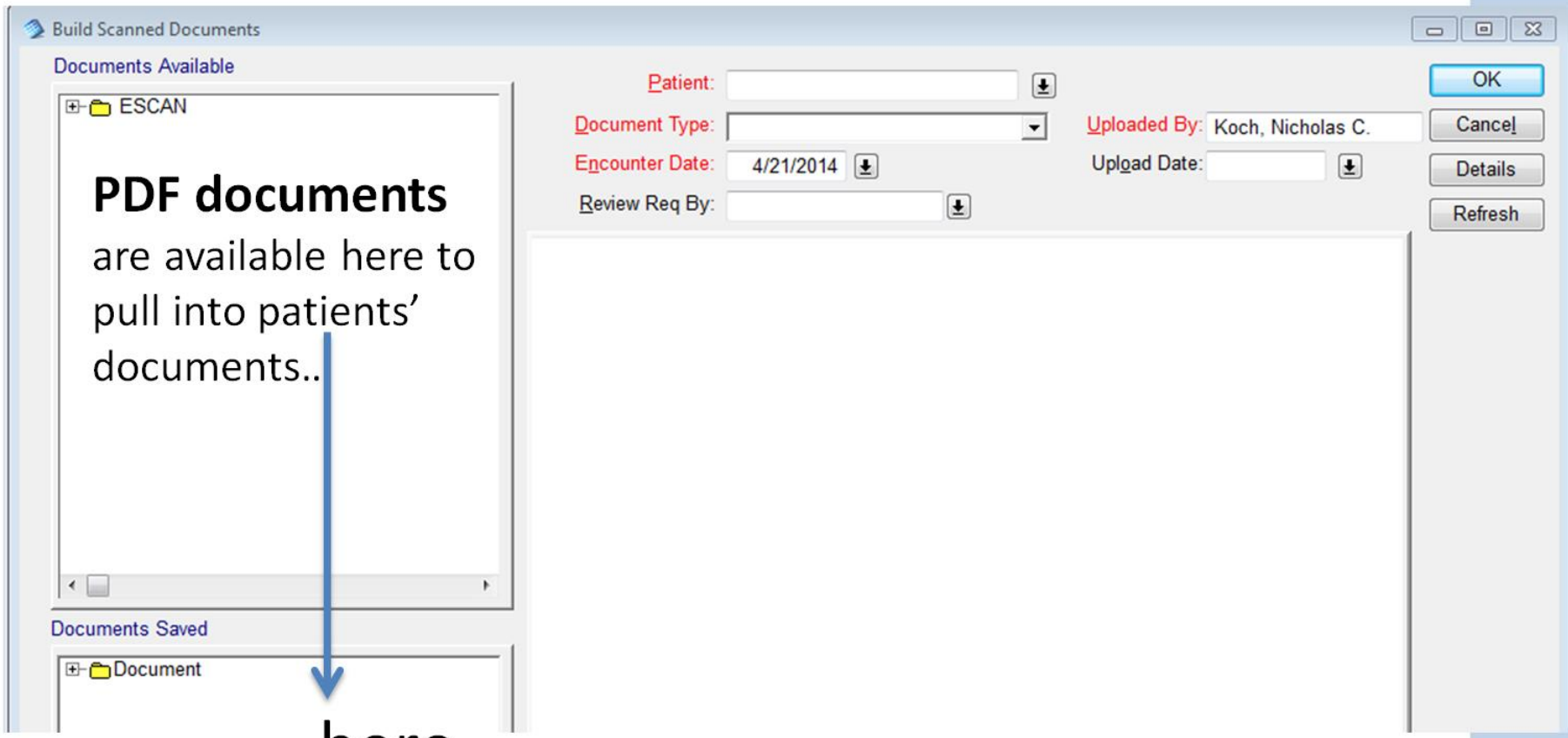
What the user sees…

- The PINNACLE user only gives the name to the individual .PS files, presses

Steps 1….*n*

Step *n* +1

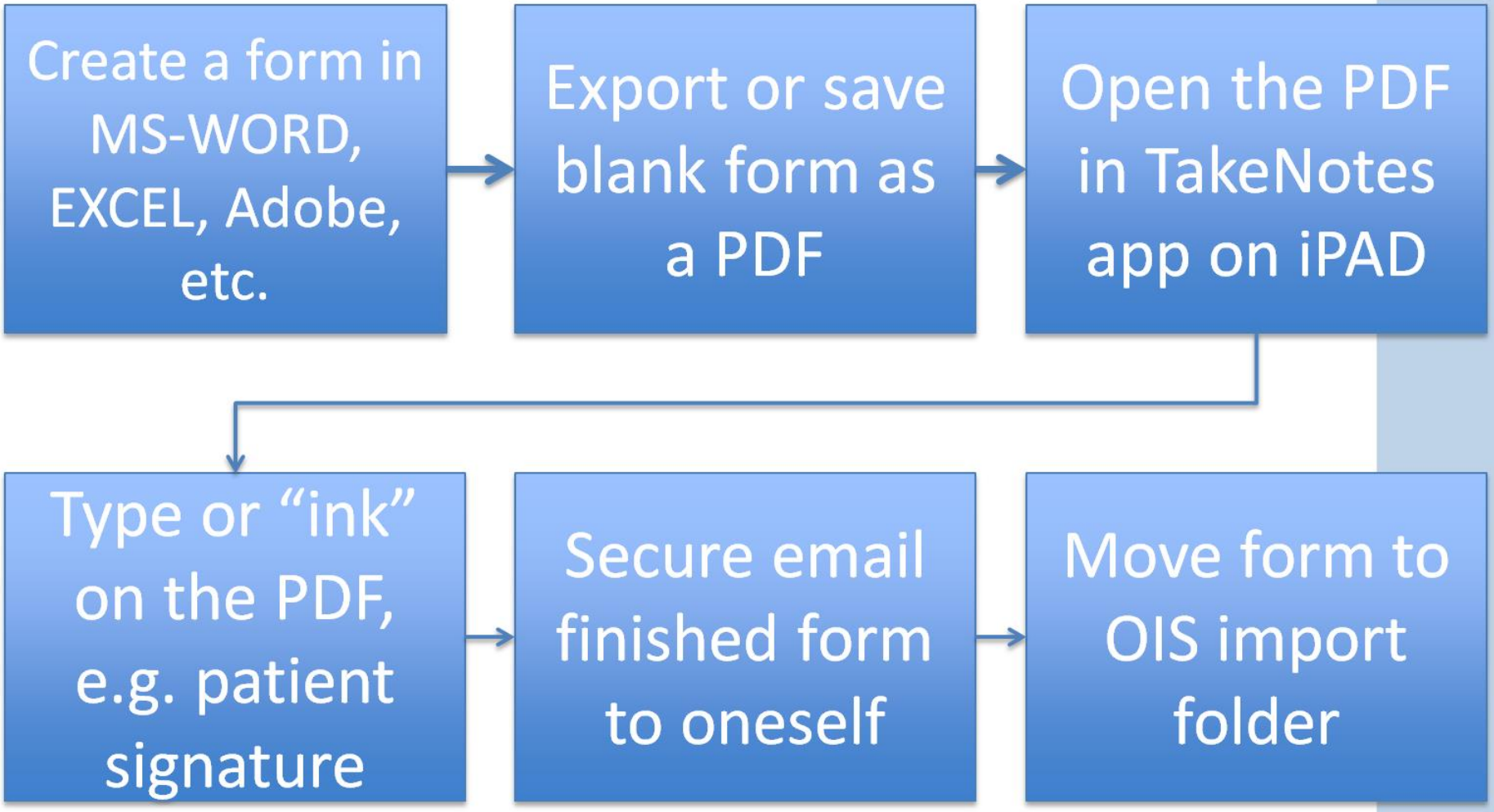



Build Scanned Documents
Documents Available
ESCAN
PDF documents
are available here to pull into patients' documents..
Documents Saved
Document
...here.
Patient:
Document Type:
Encounter Date:
4/21/2014
Review Req By:
Uploaded By:
Koch, Nicholas C.
Upload Date:
OK
Cancel
Details
Refresh

Tools, tricks, and workarounds

PAPERLESS FORMS FOR EVERYONE

How MUSC setup a form for inking on an iPAD



Tools for electronic forms on an iPAD

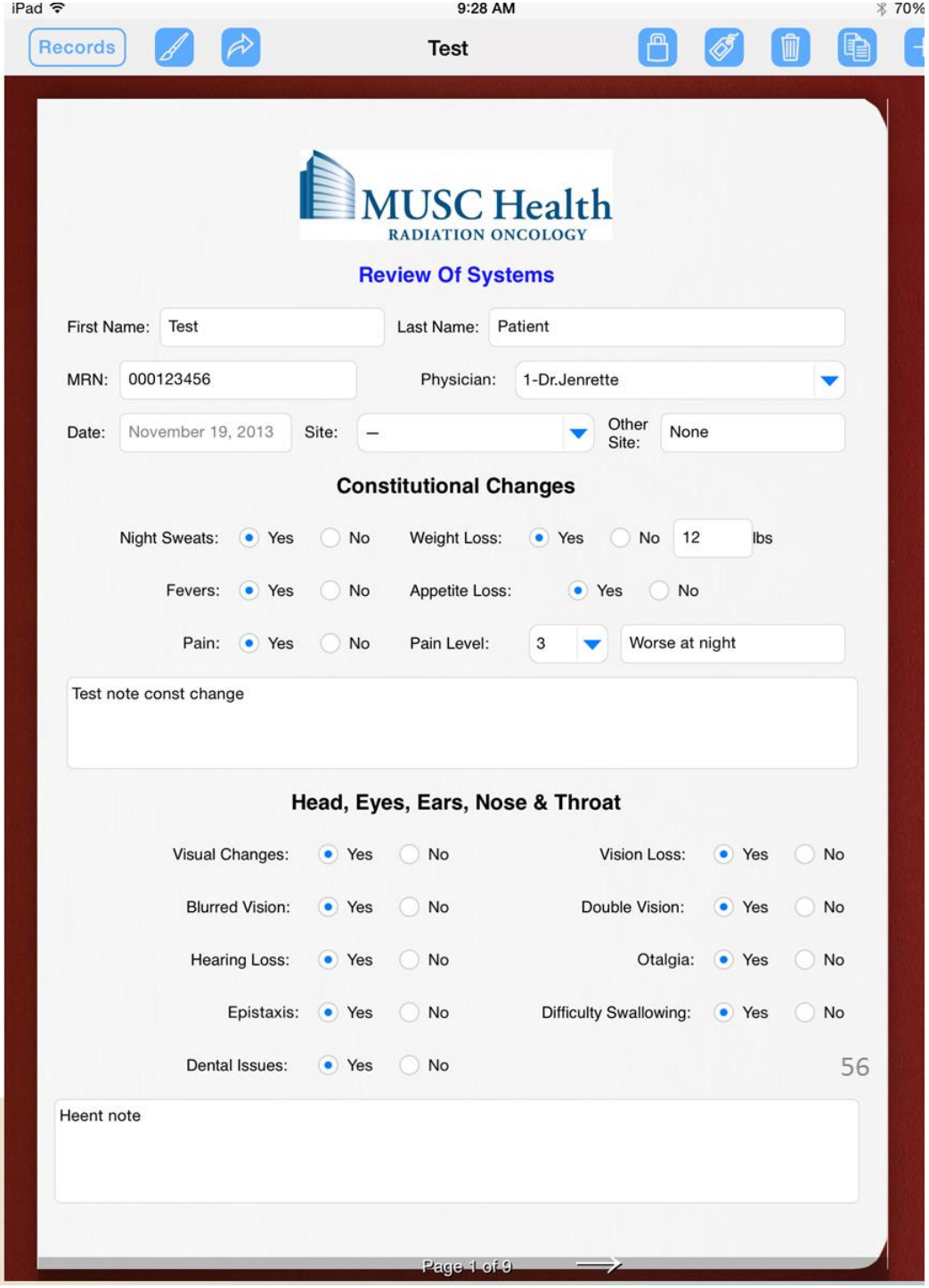
- TakeNotes app on iPAD by Tipirneni Software LLC
  - $3.99 on iTunes
  - Captures signature using PDF as background image
- Currently using the technique for patient consent forms

Tools for electronic forms on an iPAD

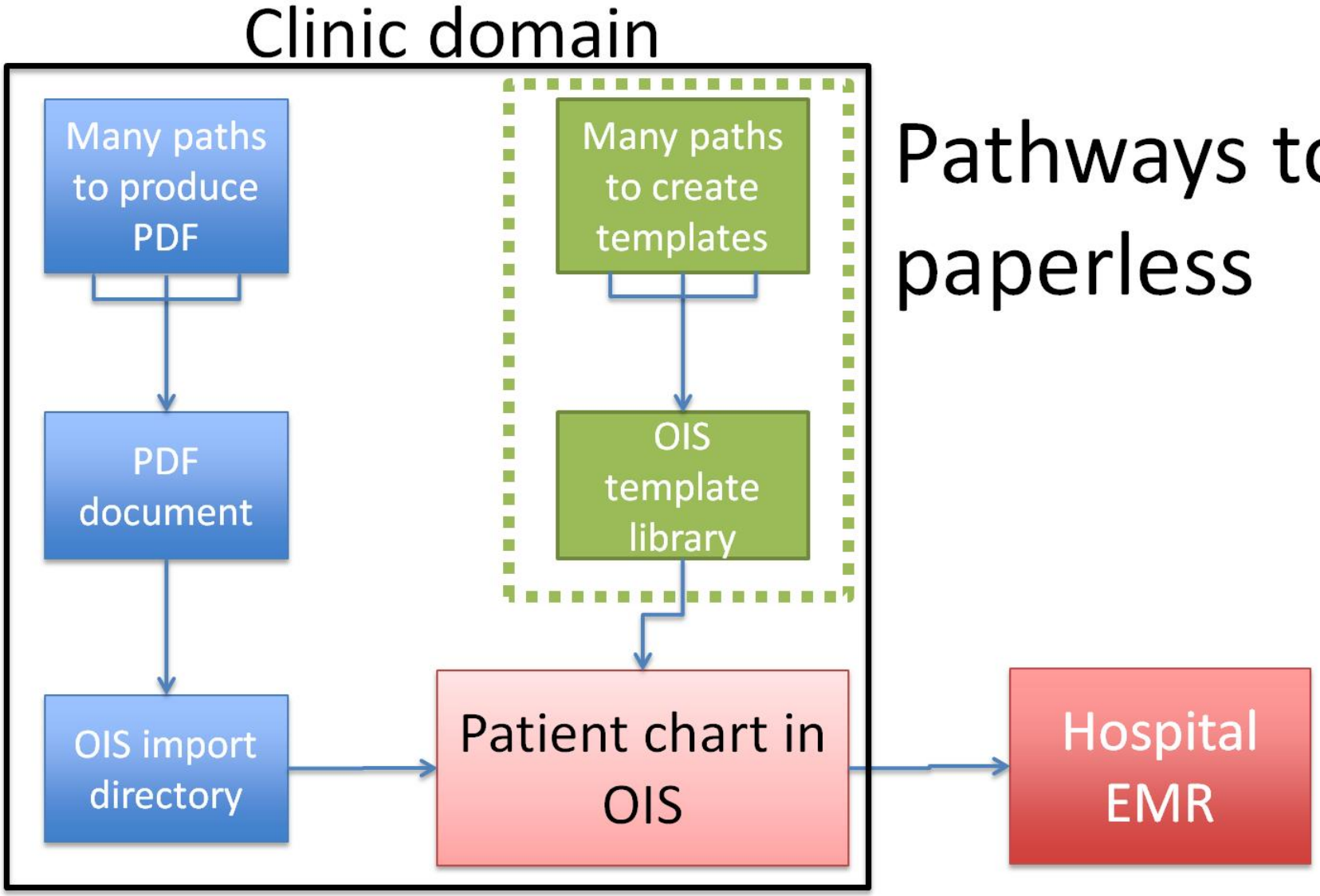
- FormConnection (formconnections.com, $10 on iTunes)
  - Pro: create forms with drop downs
  - Cons: forms have to be edited in app, then emailed to self for import into OIS import directory (eSCAN)
- Example: Review of Systems (ROS) form
- Also look at FormFast.com
- 3rd-Party systems rely on users to manually export, move, and import the PDF into the OIS.

Review of Systems (ROS) form on iPAD

Completed form is emailed to self, then moved to OIS import directory

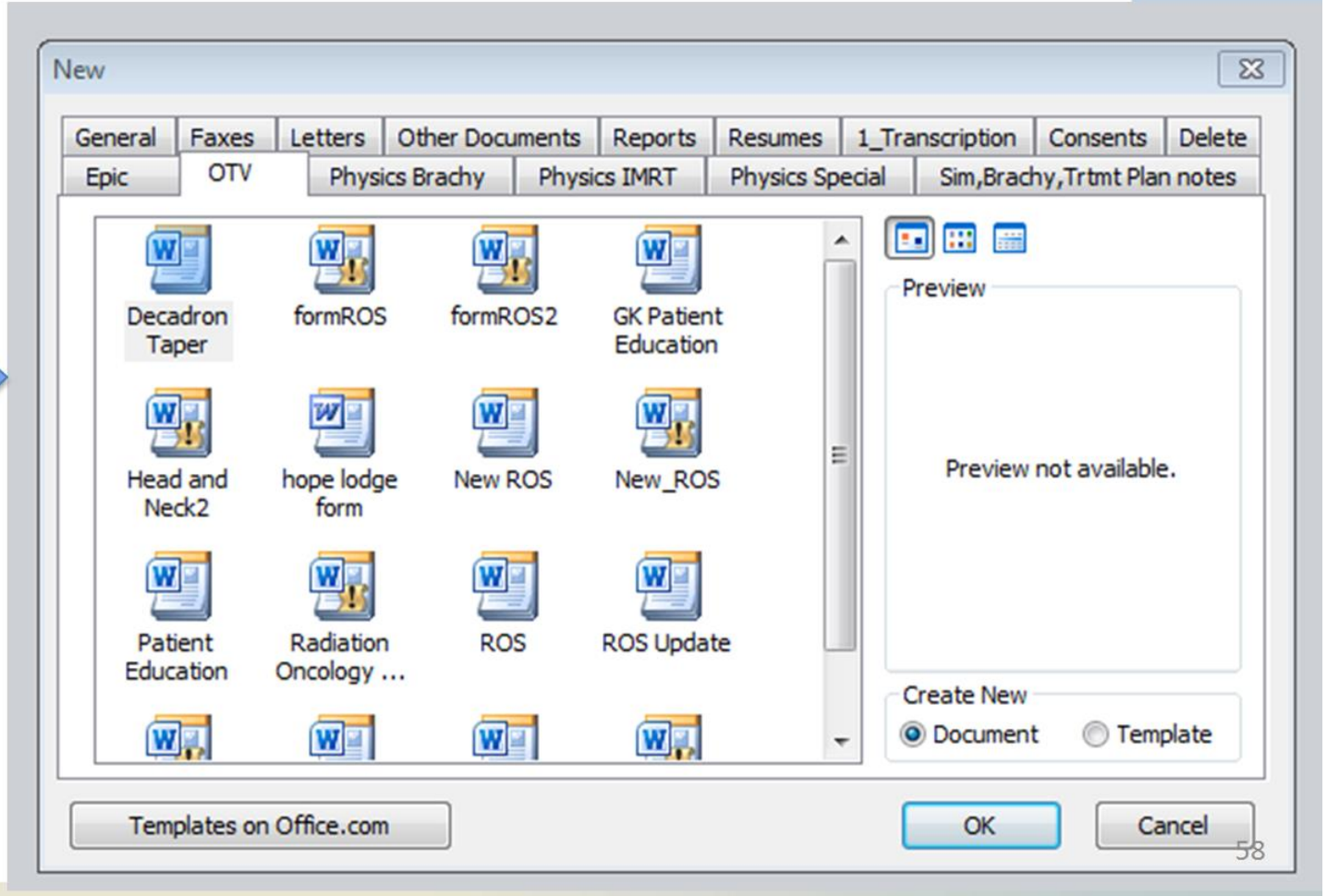


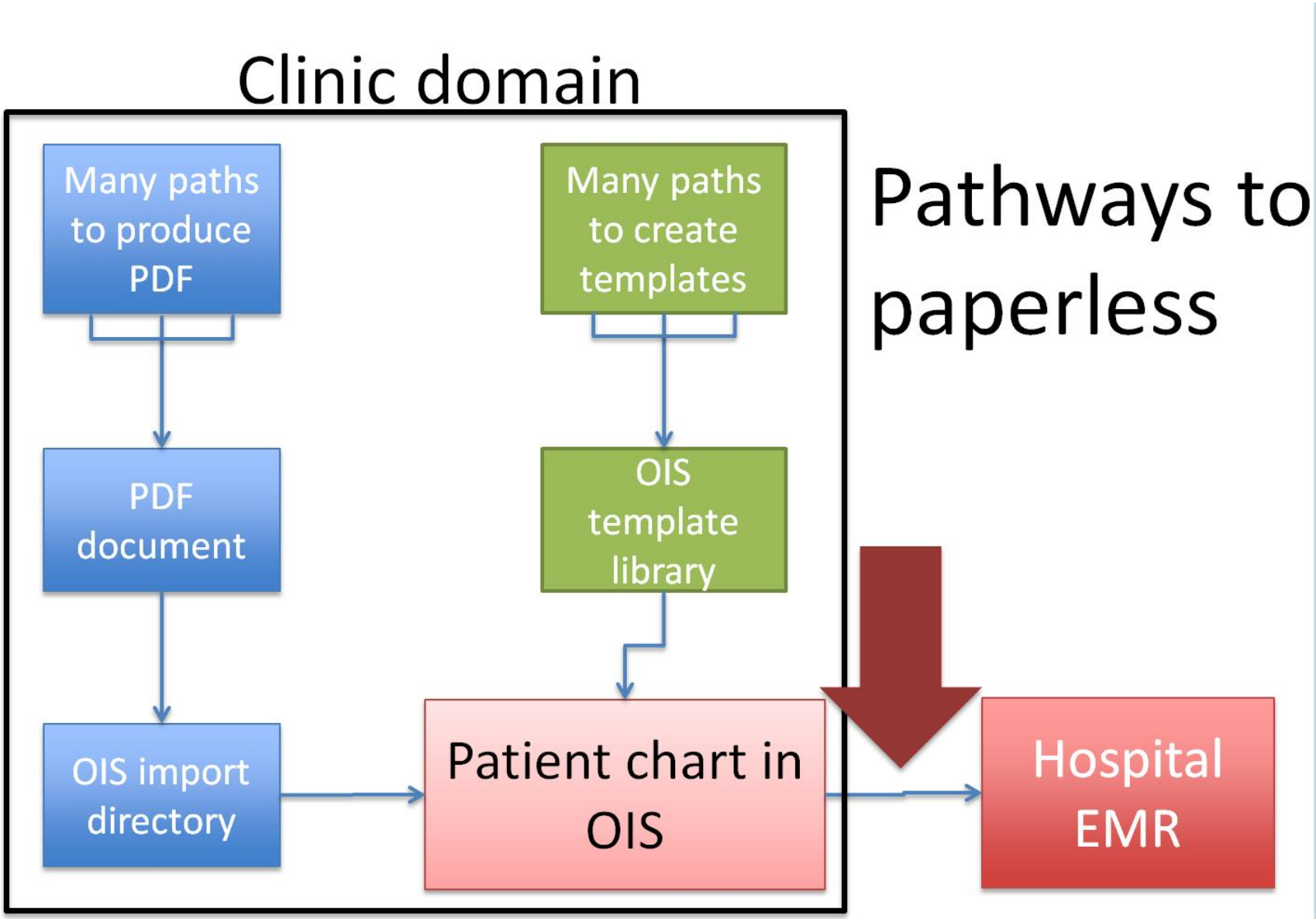
Pathways to paperless



Library of templates

MOSAIQ template window




Clinic domain
Many paths to produce PDF
Many paths to create templates
Pathways to paperless
PDF document
OIS template library
OIS import directory
Patient chart in OIS
Hospital EMR

Compatibility with hospital system is a potential barrier

- eSCRIBE template automatically populates patient & treatment info
- Need to export to hospital EMR via HL7
- Some fields in MQ 2.3 template are inaccurately rendered after transmission through HL7
- Workaround: manually alter doc to correctly rendered by HL7, e.g. Tx Summary
- MQ 2.5 is promised to have enhanced features to improve interface to hospital EMR systems

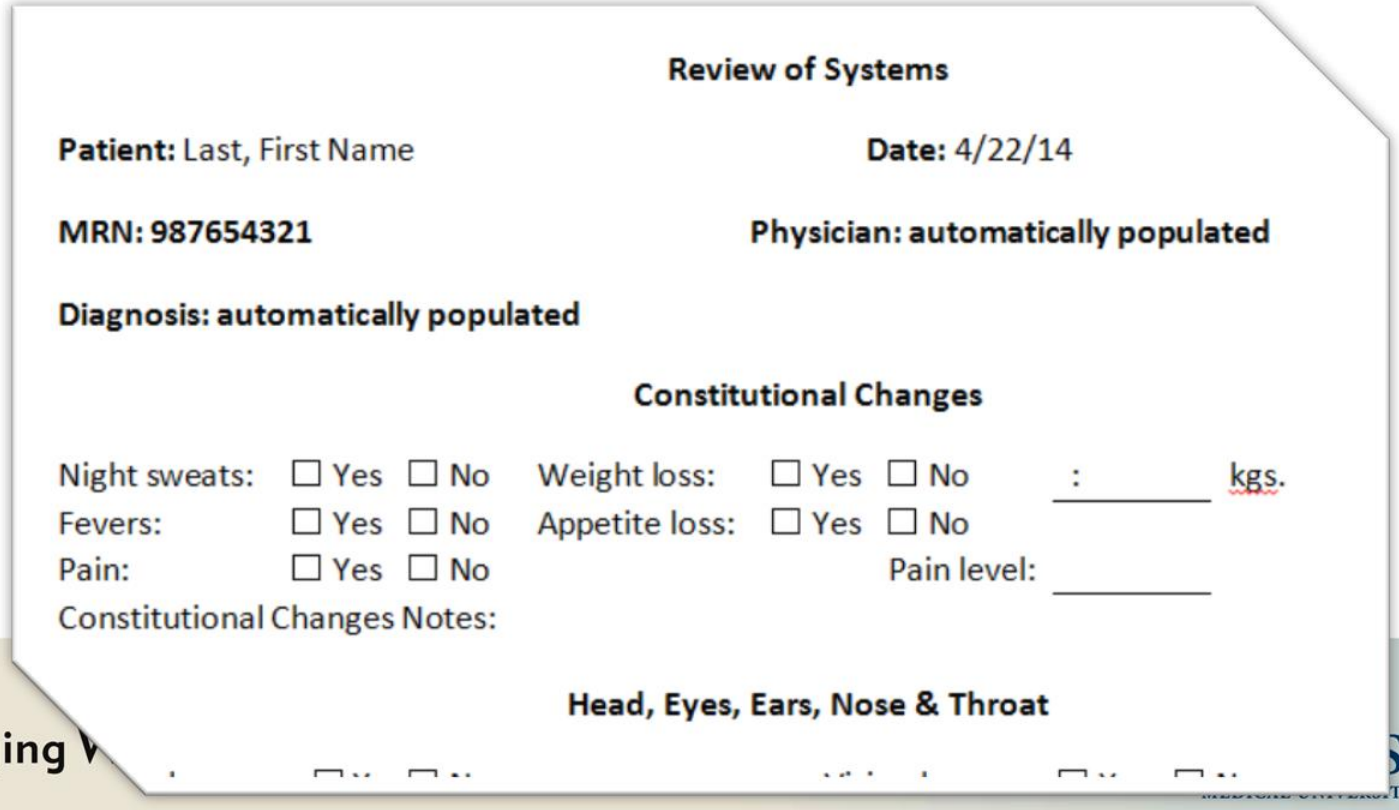
WORKS IN PROGRESS

Windows tablets replacing iPAD

- Install MQ directly on Win tablet
- Create VBA forms for tablets running Windows
- Streamline workflow by increasing direct use of templates contained within the OIS

EMR supports research

- The next ROS form will automatically store data in a searchable database.



Review of Systems

Patient: Last, First Name **Date:** 4/22/14

MRN: 987654321 **Physician: automatically populated**

Diagnosis: automatically populated

Constitutional Changes

Night sweats: ☐ Yes ☐ No Weight loss: ☐ Yes ☐ No : _____ kgs.
Fevers: ☐ Yes ☐ No Appetite loss: ☐ Yes ☐ No
Pain: ☐ Yes ☐ No Pain level: _____
Constitutional Changes Notes:

Head, Eyes, Ears, Nose & Throat

Summary

- Key to adoption of the electronic paradigm in your clinic is leadership recognizing the inevitability of EHR replacing paper-based records and the cost associated with not converting
- View the adoption of EHR as an individual decision based on a cost/benefit analysis so that you can help facilitate that decision in others
- Home-grown solutions will continue to be necessary until tools and capabilities for paperless charting improve among vendors

References

- "ASTRO launches 2014 EHR incentive program "Meaningful Use toolkit" https://www.astro.org/Practice-Management/Reimbursement/Medicare/News/2014/ASTRO-launches-2014-EHR-Incentive-Pro, accessed on March 15, 2014.
- "EHR Incentive Programs" http://www.healthit.gov/providers-professionals/ehr-incentive-programs, accessed on March 15, 2014.
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- Harshberger et al. "Outcomes of computerized physician order entry in an electronic health record after implementation in an outpatient oncology setting." J Onc Prac 2011, **4**:7.
- Shen et al. "Pilot study of meaningful use of electronic health records in radiation oncology" J Onc Prac 2012, **4**:8.
- Simon et al. "Lessons learned from implementation of computerized provider order entry in 5 community hospitals: a qualitative study" *BMC Medical Informatics and Decision Making* 2013, **13**:67.