A FUNCTIONING PAPERLESS LABORATORY

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Disclosure of Financial Interest

The Presenter has no financial interest in any reference to any copyrighted, registered, or trademarked products.
Outline

The Concept of Paperless Labs

Example of Operational Paperless Lab

Focus Group-Pilot Study
Paperless?

What does it mean to be paperless?

Where do I start?

What are the benefits?

Is it more trouble than what it’s worth?

How do I train my staff?

What resources are available?

How long will it take?
Defining \textit{Paperless}

“Recording or relaying information by electronic media rather than on paper”

\textbf{Merriam-Webster Dictionary}
First use: 1969

“An environment where an official document related to the execution of the course of business is stored on electronic (digital) media”

\textbf{Focus Group’s definition of “paperless”}
Laboratory Preparation

Macro Installation

Hardware Acquisition

Site Preparation
Initial Conditions

Handwritten worksheets

No computers at workstations

Information transcribed at cubicles outside of laboratory

3 GC-MS, 0 GC-FID

UV used as presumptive screen for concentration
Generally Speaking

Submission forms scanned and attached to LIMS

Evidence processed and description entered in LIMS

2D evidence barcodes printed and placed on physical evidence

1D barcode printed for instrument GC vial
Generally Speaking

Weight information is acquired via commercial software and imported into the case using custom software.

Data reports are saved as PDFs, attached to case in LIMS.

A crystal report gathers all information and creates a case worksheet, which is attached to case file in LIMS.
Laboratory Upgrades

Addition of computers at workstations

Worksheets converted to an electronic form

Cameras added to microscopes

Addition and validation of GC-FID for drug screen

Upgrade of GC-MS to fast GC

Testing and validating macros
Laboratory Upgrade

Macros fully implemented

Primary instrumentation for all types of case samples

GC-FID (presumptive)

GC-MS (confirmation)

Manual UV analysis eliminated

Use of Retention Index (RI) in lieu of multiple injections of standards
### JAF FORENSIC CENTER – CS WORKSHEET

**Exhibit** | HARS/A | SPOTS/B | SEEDS/C | Diagnosis | Levine | oz. (0.0353) |
---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

### MARIEJUANA

- **Exhibit** | **Vol. Used** | **Marquis** | **Ruperal** | **UV Pos.** | **N/D** | **GC Conc.** | **IR** | **GCMS** |
---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### COCAINE (.430)

- **Exhibit** | **Vol. Used** | **Marquis** | **Ruperal** | **UV Pos.** | **N/D** | **GC Conc.** | **IR** | **GCMS** |
---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### OTHER

- **Exhibit** | **WvVol** | **Marquis** | **Other** | **UV Abs** | **GC** | **IR** | **GCMS** |
---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

### NOTES

- **Post-Tare Weight** | **Weight** |
---|---|
| | |
| | |
PDF Automation

Macros amended further for multi-page PDFs

Stored only on local hard drive and added copy commands to send PDF and raw data to server

1 exhibit = 3 data PDFs

1 FID (1 page)
1 GCMS blank (1 page)
1 GCMS data (1-∞ pages), 1 page per integrated peak within 1% of the standard RI
LIMS Integration

Documents/images attached to LIMS:

Initial “e-case file” consisted of the following:
  - Scanned submission form
  - Attached images
  - Attached PDF files
In-House Barcode Software

Software created by IT department to print 2-D label for evidence and 1-D labels for GC-vials

Eliminates risk of loss of permanent marker by solvents

Makes GC-Vials legible

Cost is a fraction of pre-printed labels with much more information
Barcode for GC Vials

- Converted from barcode
- Actual Barcode with dashes
- Solvent: None
- Analyst: Stephen Houck, B.S.,
- Year: 2010
- Exhibit #
- Run # (A-Z)
- Case Number
- Instrument
Document Security

Three types of electronic signature

- Digital signature
- Electronic image of signature
- “Secure” transaction
Digital Signature

Generally does not have image of signature
Poor perception of “signature”

Usually PKI authentication to be truly authenticated

Adobe forms, email
Secure Transaction

Authenticated exhibit transfers within LIMS

No signature image, no digital signature

Chain-of-Custody is critical in forensic science

Barcode / PIN
Electronic signature

Scanned image of signature and/or initials

Things to consider:
  Security of image
  Subject to quality of scanning and sizing limitations
  Need for verification of signature
  Need for authentication (PKI / password / PIN)

Kay McClain
Analyst: Kay McClain, B.S., F-ABC

[Signatures]

Tech Reviewer: Warren Sams, Ph.D., F-ABC
Admin Reviewer: Warren Sams, Ph.D., F-ABC
Status of our Paperless in HCIFS-Crime Lab today:

Drug Chemistry, Trace Evidence (SEM) completely paperless

Toxicology, Forensic Genetic are working on macros and more automation

All QA manuals, staff training, staff PT, staff competency, SOPs, etc. is paperless

Batching system
Paperless Benefits

- Lowered supply cost
- Storage of case records not limited to physical space
- Increased efficiency in workflow
- Faster turn-around-times
- Backlog reduction
Efficiency

When altering a traditional workflow to paperless, it is highly likely that at least some areas will become more efficient

- Fewer manual processes
- Fewer errors
- Less data to cross-check (un-needed redundancies)
  Ex. Recording notes manually on a worksheet, then typing into a LIMS vs. directly typing into LIMS
Lessons Learned

Large difference between theory of paperless and its actualization

No mechanism for laboratories to learn success and missteps in the planning or implementation
Focus Group Webinar Meeting

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It was performed in conjunction with the National Forensic Science Technology Center, NFSTC
Questionnaires

Detailed questionnaires were developed and disseminated to ~30 “paperless entities” in North America

- Laboratory survey
- Vendor survey

Questions focused on paperless motivations, workflow, challenges and successes
Webinar Participants

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Assistant Deputy Director  
GBI Crime Lab

**Doug Saul**  
Forensic Biology Technical Leader,  
Section Supervisor Laboratory  
DuPage County Sheriff's Office

**Peter Natale**  
Vice President  
Forensic Advantage System

**Kirk Canty**  
LIMS Manger  
GBI Crime Lab

**Michelle King**  
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Crime Lab Director  
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Carol Andrews  
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HC Institute of Forensic Sciences

William Davis  
Trace Evidence Manager  
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Webinar Jan 10-11, 2012
Ten Topics Discussed

Topic 1: Accreditation Aspects

Topic 2: Paperless – A Fluid Idea

Topic 3: Crafting a Paperless Implementation Strategy

Topic 4: Staffing/Training Considerations

Topic 5: Storage Requirements/Contingency Measures
Ten Topics Discussed

Topic 6: Electronic Signatures

Topic 7: System Security

Topic 8: Efficiency/Automation Within a Paperless System

Topic 9: Limitations on Paperless

Topic 10: External Programs
3 “Musts” before Starting

1. One **must** have support from upper management

2. Those leading the endeavor **must** believe in the end product, themselves

3. There **must** be open communication with affected staff during the entire process
Limitations on Paperless

Potential limitations must be considered

- IT availability
- Costs
- Manpower/training
- Number of monitors
- Ability to rotate monitor
- Number/power/location of computer systems.
- Cost of specialty software
- Ongoing maintenance costs
Staffing/Training Considerations

Close relationships with in-house IT staff
   Encourage observation of full existing workflow before changes are made

Presence of superusers

Anticipate training struggles early
   Psychology of a paradigm shift
   Old habits die hard
Staffing/Training

Problem: Extended use of computer monitors
   
   Eyestrain, jumbled screen appearance

Solution: Widescreen or extra monitor
   
   Print hardcopies while getting used to new workflow

Must listen to employee concerns, no matter how trivial they may seem – to you.

Need to achieve essential “buy-in” of staff

Ease staff into transition
Generally Speaking...

With automation comes an increase in efficiency.

However, automation is not always needed to increase efficiency.

With simply “going paperless”, some features are bound to become more efficient. However, it might take some time to realize the efficiency “return on investment”.

Paper vs. screens on technical review
Considerations of Design and Implementation of a Paperless Laboratory

Details from these 10 discussion points were compiled into a manuscript 3, Issue 1, February 2012, pages 12-19
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Can one be *too* paperless?
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Questions?