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 *Paperless*

"Recording or relaying information by electronic media rather than on paper"

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"

Focus Group's definition of "paperless"

Laboratory Preparation

Macro Installation

Hardware Acquisition

Site Preparation

Initial Conditions

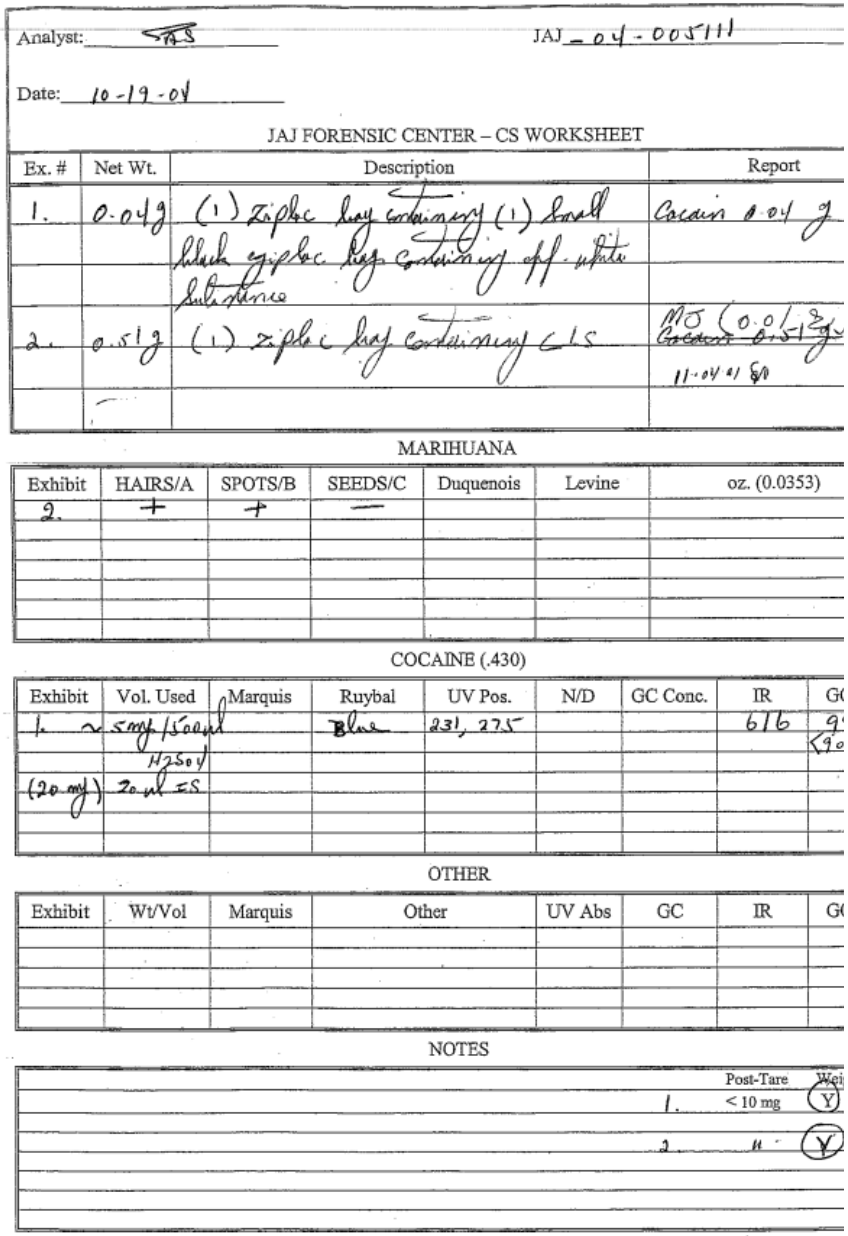
Handwritten worksheets

No computers at workstations

Information transcribed at cubicles outside of laboratory

3 GC-MS, 0 GC-FID

UV used as presumptive screen for concentration



Analyst: SAS JAJ - 04 - 005111

Date: 10-19-04

JAJ FORENSIC CENTER – CS WORKSHEET

Ex. #	Net Wt.	Description	Report
1.	0.04g	(1) ziploc bag containing (1) small black ziploc bag containing off-white lumps	Cocain 0.04 g
2.	0.51g	(1) ziploc bag containing CLS	MJ (0.018 g) ~~Cocain 0.51 g~~ 11-04-04 SAS

MARIHUANA

Exhibit	HAIRS/A	SPOTS/B	SEEDS/C	Duquenois	Levine	oz. (0.0353)
2.	+	+	—			

COCAINE (.430)

Exhibit	Vol. Used	Marquis	Ruybal	UV Pos.	N/D	GC Conc.	IR	GC
1. ~	5mg/500ml H2SO4		Blue	231, 275			676	9 <90
(20 mg)	20 ml = 5							

OTHER

Exhibit	Wt/Vol	Marquis	Other	UV Abs	GC	IR	GC

NOTES

	Post-Tare	Weigh
1.	< 10 mg	Y
2.	"	Y

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

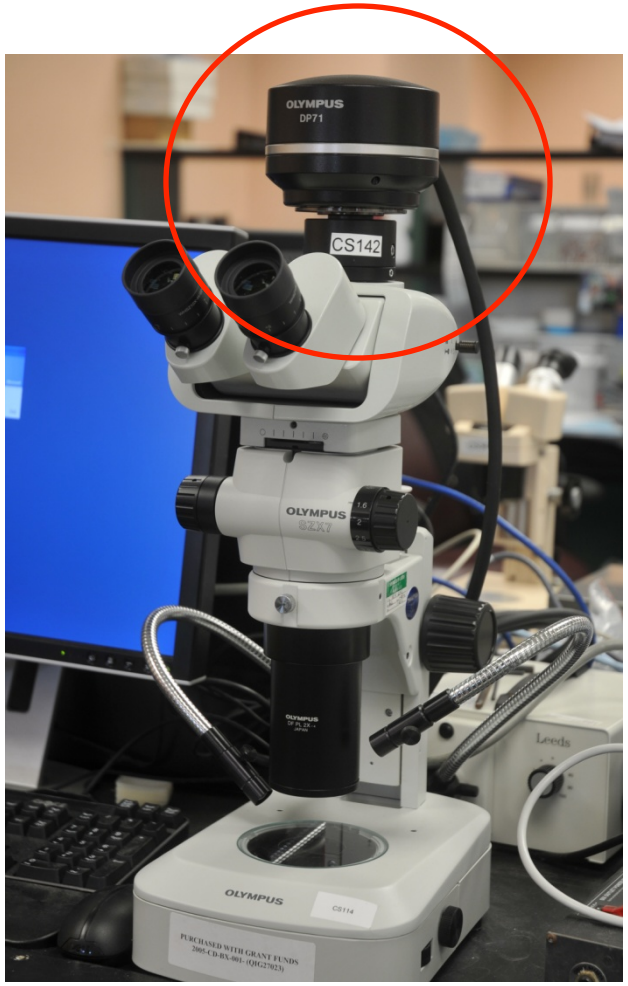
Worksheets converted to an electronic form

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

Analyst: SAS JAJ [redacted]

Date: 10-19 [redacted]

JAJ FORENSIC CENTER – CS WORKSHEET

Ex. #	Net Wt.	Description	Report
1.	0.04 g	(1) ziploc bag containing (1) small black ziploc bag containing off-white substance	Cocain 0.04 g
2.	0.51 g	(1) ziploc bag containing CLS	MJ (0.01 g) Cocaine 0.51 g 11-04-21 SA

MARIHUANA

Exhibit	HAIRS/A	SPOTS/B	SEEDS/C	Duquenois	Levine	oz. (0.0353)
2.	+	+	—			

COCAINE (.430)

Exhibit	Vol. Used	Marquis	Ruybal	UV Pos.	N/D	GC Conc.	IR	GCMS
1.	~5mg/500ul H2SO4		Blue	231, 275			676	996 3 <90 MQ
(20 mg)	20 ul IS							

CCC PROC

OTHER

Exhibit	Wt/Vol	Marquis	Other	UV Abs	GC	IR	GCMS

NOTES

	Post-Tare Weight	
1.	< 10 mg	(Y) N
2.	"	(Y)

Harris County Institute of Forensic Sciences
Controlled Substance Laboratory Worksheet

Revision# 3 Page #: 26

Controlled Substance Laboratory procedure references: CS07.4010, CS07.4011, CS07.5016 and CS.DR.4013 through CS.DR.4027.

JAJ: [redacted]	Date: 5/13/10	Evidence Seal Date: 5/13/10	Balance ID: CS21	Analyst: Shrey K. Reach	Initials:

Exhibit # 1 003	(6) Small ziplock bags, each containing crystal-like substance					
Weight	Gross Weight	Net Weight 1A-1.490 g 1B-0.847 g 1C-0.869 g 1D-0.769 g 1E-0.730 g 1F-0.739 g Total=5.444 g	Post Sampling Wt. #1 1A-1.478 g 1B-0.836 g 1C-0.858 g 1D-0.759 g 1E-0.722 g 1F-0.732 g	Post Sampling Wt. #2 1A-1.463 g 1B-0.825 g 1C-0.845 g 1D-0.748 g 1E-0.713 g 1F-0.726 g	Post Tare Weight 1A-0.001 g 1B-0.000 g 1C-0.000 g 1D-0.000 g 1E-0.000 g 1F-0.000 g	Net Weight Ounces
Green Leafy Substance	Cystolithic Hairs	Unicellular Hairs	Calcium Carbonate Spots		Seeds	Duquenois Levine
Sampling Information	Presumptive – Barcode- Solvent-Vol.-Test-Amt.Taken 1A-JA5991/GCFID/12mg/2mL N/C 1B-JA5993/GCFID/11mg/2mL N/C 1C-JA5995/GCFID/11mg/2mL N/C 1D-JA5997/GCFID/10mg/2mL N/C 1E-JA5999/GCFID/8mg/2mL N/C 1F-JA6001/GCFID/7mg/2mL N/C		Confirmatory-Barcode-Instrument- Solvent-Vol. -Amt.Taken- 1A-JA5990/GCMS/15mg/2mL N/C 1B-JA5992/GCMS/11mg/2mL N/C 1C-JA5994/GCMS/13mg/2mL N/C 1D-JA5996/GCMS/11mg/2mL N/C 1E-JA5998/GCMS/9mg/2mL N/C 1F-JA6000/GCMS/6mg/2mL N/C			Quant. Conc. ng
Data	Presumptive Sample Analysis 1A-2.457/2.465 1B-2.430/2.413 1C-1.600/1.598 1D-1.615/1.592 1E-1.620/1.598 1F-1.597/1.592		Confirmatory Sample Analysis 1A-Methamphetamine=RI%= 0.20 1B-Methamphetamine=RI%= 0.08 1C-Methamphetamine=RI%= 0.05 1D-1st run=invalid blank 2nd run=Methamphetamine=RI%= 0.08 1E-Methamphetamine=RI%= 0.06 1F-1st run=invalid blank 2nd run=Methamphetamine=RI%= 0.08			FINAL RESULT Methamphetamine= 5.444 g
Other Notes	5/18/10=took out extra / in confirmatory box. 5/19/10=added 2nd run GCMS for exhibit 1D & 1F					

Exhibit # 2 002	(2) Small ziplock bags containing a total of (50) light green, cap shaped, single scored tablets, each labeled " Watson 503"					
Weight	Gross Weight 41.412 g	Net Weight	Post Sampling Wt. #1	Post Sampling Wt. #2	Post Tare Weight 0.000 g	Net Weight Ounces
Green Leafy Substance	Cystolithic Hairs	Unicellular Hairs	Calcium Carbonate Spots		Seeds	Duquenois Levine
Sampling Information	Presumptive – Barcode- Solvent-Vol.-Test-Amt.Taken		Confirmatory-Barcode-Instrument- Solvent-Vol. -Amt.Taken-			Quant. Conc. ng
Data	Presumptive Sample Analysis		Confirmatory Sample Analysis			FINAL RESULT No Analysis Performed
Other Notes	bag 1=24 tabs, bag 2=26 tabs. 5/19/10=corrected the description. 5/24/10=added parentheses					

Exhibit # 3 001	(1) Small ziplock bag containing green leafy substance					
Weight	Gross Weight 1.490 g	Net Weight	Post Sampling Wt. #1	Post Sampling Wt. #2	Post Tare Weight 0.000 g	Net Weight Ounces
Green Leafy Substance	Cystolithic Hairs	Unicellular Hairs	Calcium Carbonate Spots		Seeds	Duquenois Levine
Sampling Information	Presumptive – Barcode- Solvent-Vol.-Test-Amt.Taken		Confirmatory-Barcode-Instrument- Solvent-Vol. -Amt.Taken-			Quant. Conc. ng
Data	Presumptive Sample Analysis		Confirmatory Sample Analysis			FINAL RESULT No Analysis Performed
Other Notes						

Exhibit #						
Weight	Gross Weight	Net Weight	Post Sampling Wt. #1	Post Sampling Wt. #2	Post Tare Weight	Net Weight Ounces

Form #: CSF09.078 Rev.: 13 Approver: Mark Dixon

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

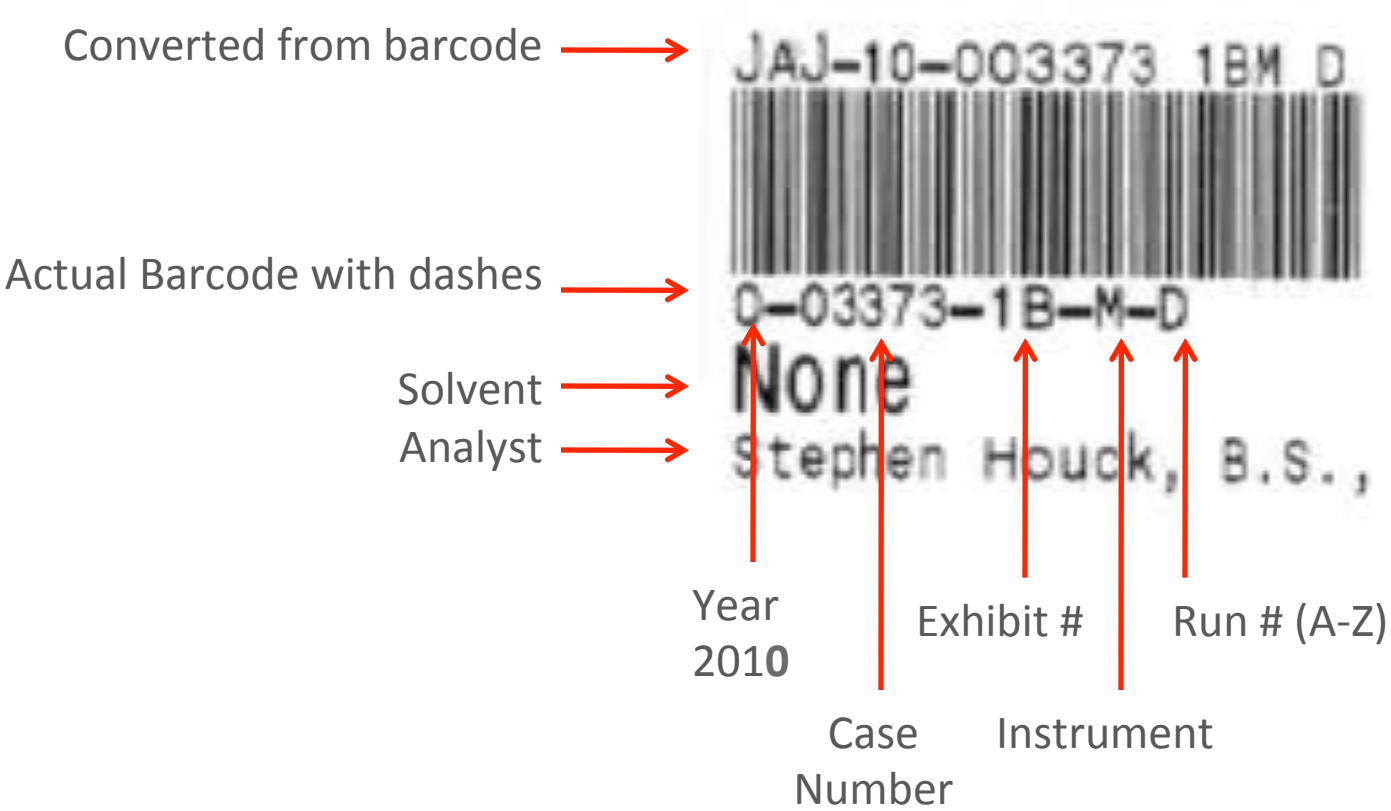
Software created by IT department to print 2-D label for evidence and 1-D labels for GC-vials

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



Document Security

Three types of electronic signature

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

Digital Signature

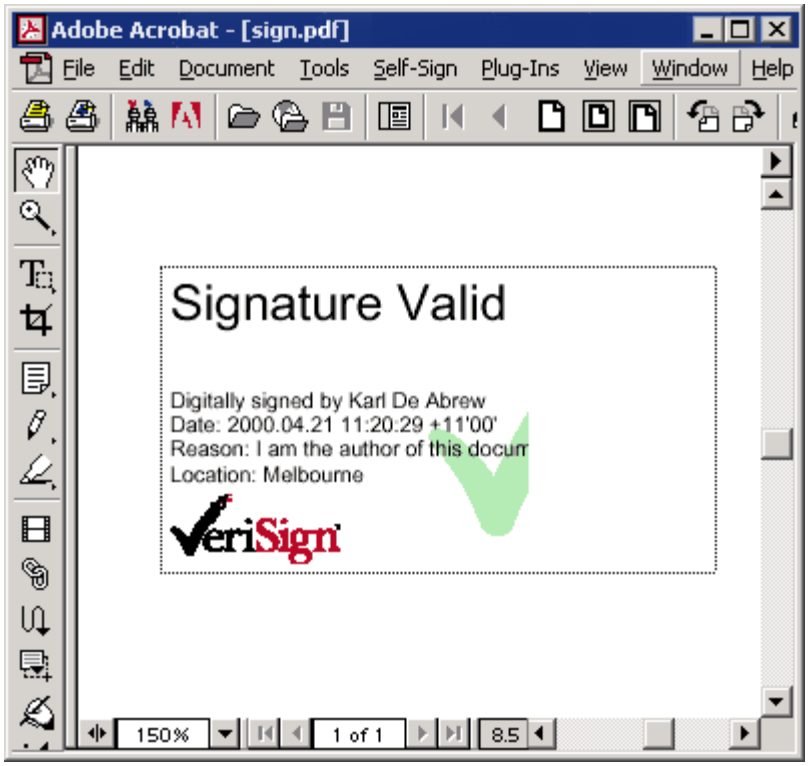
Generally does not have image of signature

- Poor perception of "signature"

Usually PKI authentication to be truly authenticated

- $$$$

Adobe forms, email



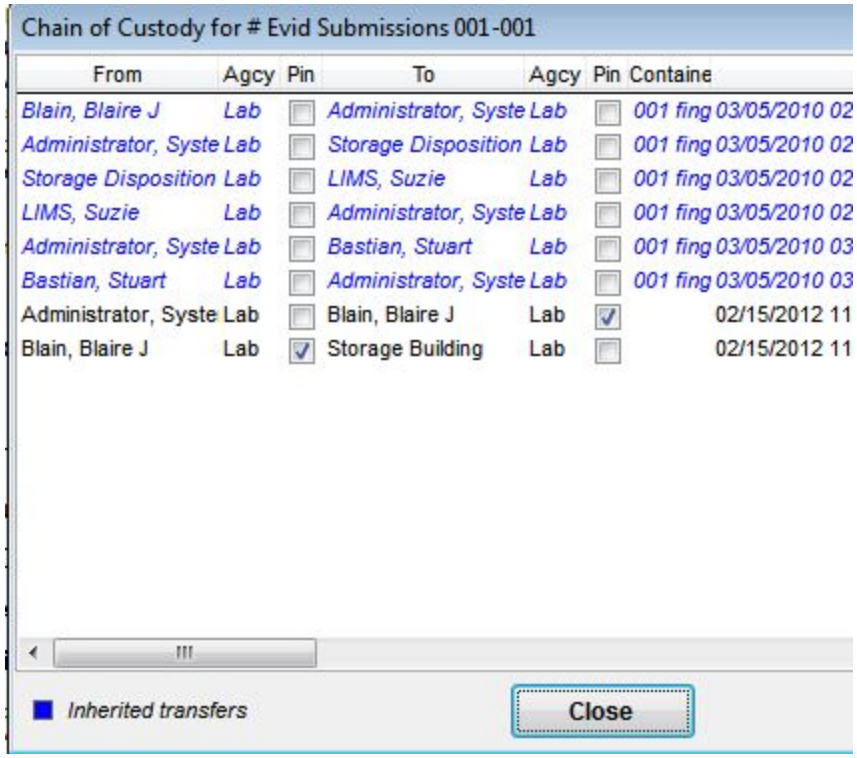
Secure Transaction

Authenticated exhibit transfers within LIMS

No signature image, no digital signature

Chain-of-Custody is critical in forensic science

Barcode / PIN



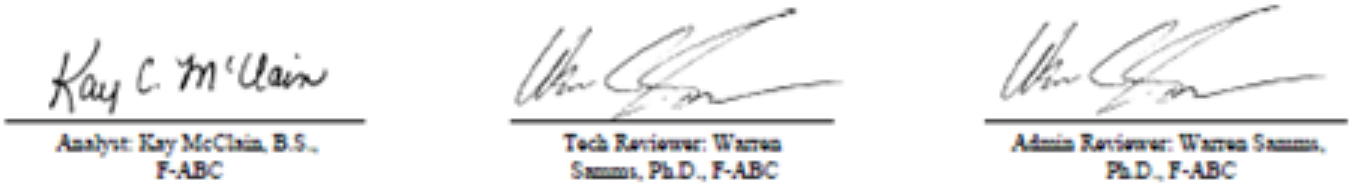
From	Agcy	Pin	To	Agcy	Pin	Containe
Blain, Blaire J	Lab	☐	Administrator, Syste	Lab	☐	001 fing 03/05/2010 02
Administrator, Syste	Lab	☐	Storage Disposition	Lab	☐	001 fing 03/05/2010 02
Storage Disposition	Lab	☐	LIMS, Suzie	Lab	☐	001 fing 03/05/2010 02
LIMS, Suzie	Lab	☐	Administrator, Syste	Lab	☐	001 fing 03/05/2010 02
Administrator, Syste	Lab	☐	Bastian, Stuart	Lab	☐	001 fing 03/05/2010 03
Bastian, Stuart	Lab	☐	Administrator, Syste	Lab	☐	001 fing 03/05/2010 03
Administrator, Syste	Lab	☐	Blain, Blaire J	Lab	☑	02/15/2012 11
Blain, Blaire J	Lab	☑	Storage Building	Lab	☐	02/15/2012 11

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)



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

This project was supported by NIJ Award #2010-DN-BX-K210, NFSTC #25-6370-07, awarded by the National Institutes of Justice, Office of Justice Programs, and the U.S. Department of Justice.

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

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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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Section Supervisor Laboratory
DuPage County Sheriff's Office

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LIMS Manger
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Mesa (AZ) Police Department Forensic Services

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 <u>must</u> have support from upper management

2. Those leading the endeavor <u>must</u> believe in the end product, themselves

3. There <u>must</u> 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".

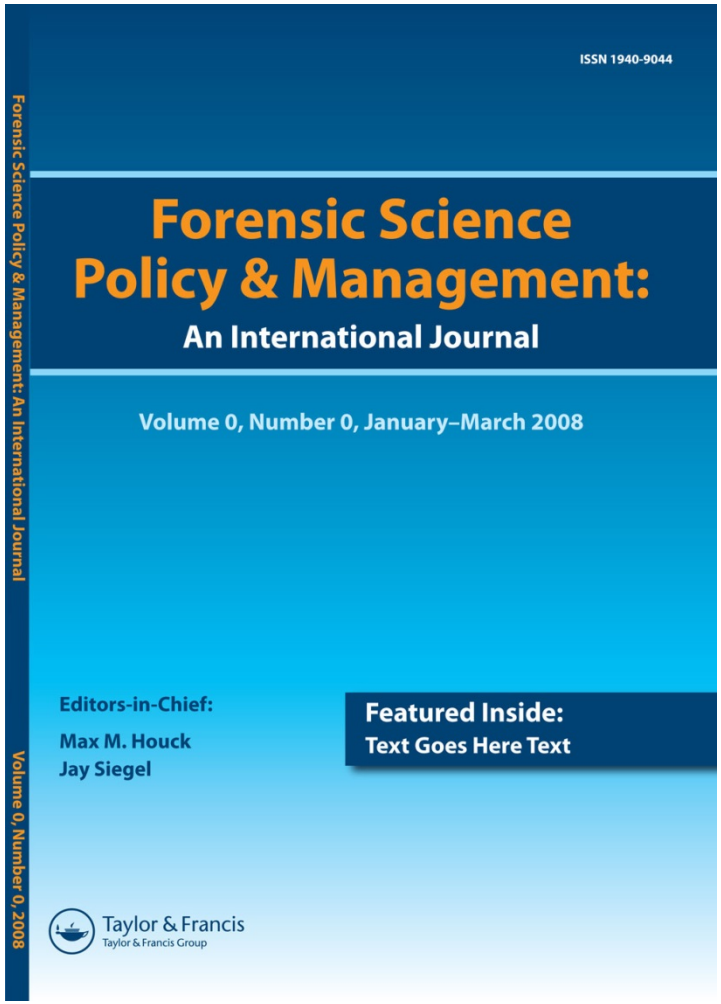
- Paper vs. screens on technical review

Considerations of Design and Implementation of a Paperless Laboratory

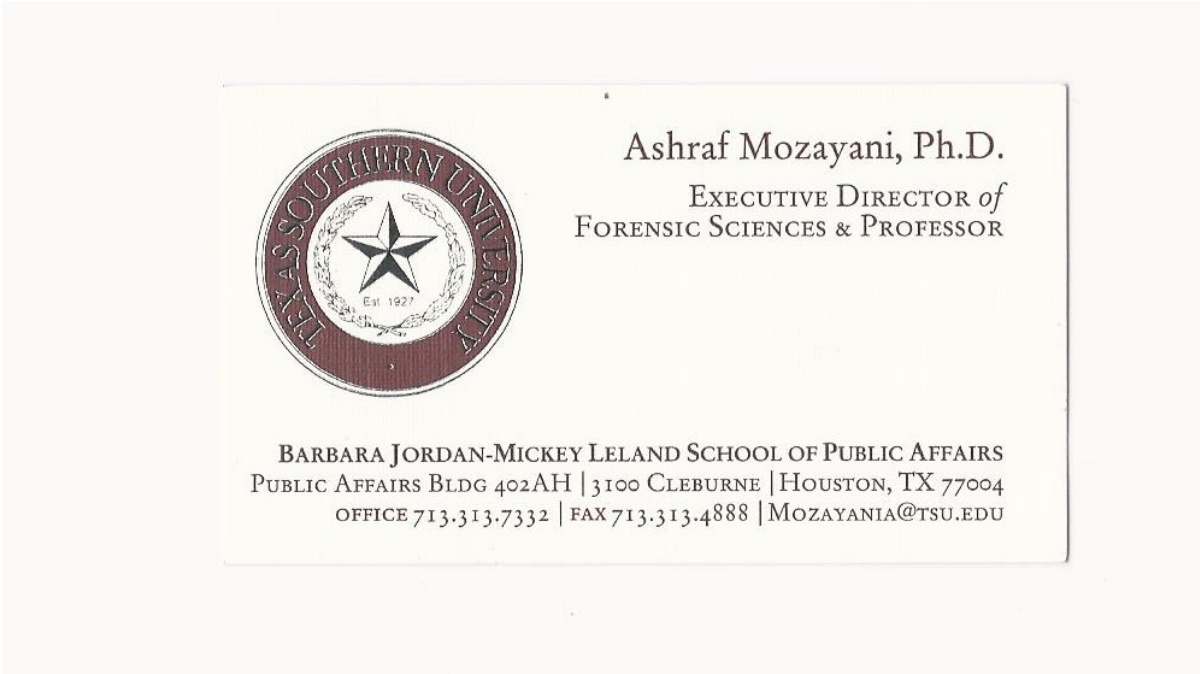
Details from these 10 discussion points were compiled into a manuscript

3, Issue 1, February 2012, pages 12-19

Published online: 12 Sep 2012



Can one be *too* paperless?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Questions?