A Fully-implemented Digital Pathology System

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New Disruptive Technologies



Radiology led the way









What held pathology back?





What held pathology back?



• Slow

• Not streamlined for daily work

• Large files

• Expensive

• Unclear if legal



First functional system





Perfect posture





Local Connections



Local Connections

Slide review for Mohs, etc

Reading own slides

Special stains

Teaching

Remote residents

Zoom lectures







• Off site pathologist—centralized lab

Pathologist mobility (home/work/travel)

Consultation—Intra- and Extra-

Scanning for other people
Dermatologists
Pathologist without a scanner

• Education

Research studies

Serving rural areas



Second opinion

| | = M Gmail | Q spies melanoma X - | |
|-----|--|--|--|
| | - Compose | | < : |
| | Inbox 5 ★ Starred Snoozed Important Sent Drafts 1,062 | Second opinion for case CON191670 Curtis Thompson <curtisinportland@gmail.com> to Jessica * Please review case CON191670: https://dps.cta-lab.com/pathologysuite/#/viewer?images=1.3.46.670589.45.1.1.254687382049802.1.9156.14 596474194382786,12.20307374334818&bottomright=43.70847419438279,14.701073743348179&server=</curtisinportland@gmail.com> | Fri, May 24, 10:12 AM (3 days ago) 558632919870.3&topleft=38. |
| | Categories 201903DermPathS CTA Financials Curtis - + Nathan Thompson Nathaniel Thompson | 55 y/o female left cheek. I think this is a benign nevusbut there is some pleomorphism. Don't think Ki or pHH3 will help (lots of lymphocytes). Benign? p16? This will likely be left for you. thx | |
| .ab | | Jessica Spies to me * intradermal Spitzoid melanocytic tumorput arrows on large melanocytes with red nucleoli at deep tissue edge. I would do p16, BAP-1would preserve tissue for molecular. Why don't you order p16 and put my name on it? | Fri, May 24, 10:18 AM (3 days ago) |

Second opinion



Second opinion





Sharing interesting cases

| | M Gmail | | Q | spies melanoma | × • | 1 | | | |
|---|-----------------|-------|---|---|--|---|--|--|--|
| + | Compose | | ÷ | | 6 of about 137 < | > | | | |
| | Inbox | 5 | | amazing case of nail LE ⋗ | | | | | |
| × | Starred | | | Curtis Thompson <curtisinportland@gmail.com></curtisinportland@gmail.com> | Wed, May 15, 10:02 AM (12 days ago) | 8 | | | |
| C | Snoozed | | 0 | to me, bcc: Steve, bcc: Jessica, bcc: Brian, bcc: Jim 👻 | | | | | |
| | Important | | | Please review case | | | | | |
| > | Sent | | | CT1910336: https://dps.cta-lab.com/pathologysuite/#/viewer?images=1.3 | .46.670589.45.1.1.254687382049802.1.9156.1557751713700.3&topleft=19. | | | | |
| | Drafts | 1,062 | | 4037499999999997,-1.4141412732473014&D0ttoffingint=39.70373,0.0030 | sorzorsz490aserver-https.//dps.cla-lab.com | | | | |
| | Categories | | | check out the CD123it really helped. This came as r/o glomus/melanom | na/dermatitis. I called and they said she has LE elsewhere. | | | | |
| | 201903DermPathS | | | | | | | | |
| | CTA Financials | | | enjoy! | | | | | |
| | Curtis 👻 | + | | ••• | | | | | |



Sharing cases—33 y/o female "Neoplasm vs dermatitis"











CD123





CD123





Sharing cases—Nail Lupus Erythematosus



| • | | | | | |
|---|------------------------------------|----------------------------|--|---|--|
| Active Priority | Showing case 1-122 of 122 | cases in 'Keep online' | | | 1 case(s) select |
| High Priority 51 | Cases | Slides | | | |
| Cases In preparation 123 | ABOMP - = 14-Jul-17 10:30 | ABOMP ABOMP | 01-Jan-00 (-) Other | 1 | Kratochvil, Jim Finished |
| For Review 15270 | ABOMP201807 - 01-0ct-18 14:15 | ABOMP201807 ABOMP201807 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| Finished 30465 All cases 45858 | ABOMP201808 - = 01-Oct-18 14:15 | ABOMP201808 ABOMP201808 | _ 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| Other Action Required | ABOMP201809 - = 01-Oct-18 14:29 | ABOMP201809 ABOMP201809 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| Deleted Items | ABOMP201810 - = 01-Oct-18 14:29 | ABOMP201810 ABOMP201810 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| Tags (122) Keep online | ABOMP201811 - = 01-Oct-18 14:30 | ABOMP201811 ABOMP201811 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| (26) Demo Cases (7) Research Cases | ABOMP201812 - = 01-Oct-18 14:30 | ABOMP201812 ABOMP201812 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| | MK19141 - = 01-Mar-19 16:34 | MK19141 MK19141 | 01-Jan-00 (-) Other | 1 | Klein, Marla Finished |
| | MK19145 - = 01-Mar-19 11:41 | MK19145 MK19145 | 01-Jan-00 (-) Other | 1 | Klein, Marla Finished |
| | MK19168 - = 12-Mar-19 10:05 | MK19168 MK19168 | 01-Jan-00 (-) Other | 1 | Klein, Marla Finished |
| | NW17-155 - = 16-Apr-18 15:02 | NW17-155 NW17-155 | 01-Jan-00 (-) Other | 1 | <unassigned> Finished</unassigned> |
| | NW1810 | NW1810 | 01-Jan-00 (-) | 1 | Kratochvil, Jim Finished |

E

Residency Program



Residency Program



Education



Cost

\$200,000 per machine Or \$4,800/month/machine for 72 months then

\$1,300/month/machine ongoing for service contract



Need 3 machines



Need at least 3 machines

Implementation

Implementation

- Slide prep flow of work
- Paper vs paperless
- Digital and laboratory information system (LIS) marriage
- Data storage
- Laboratory regulation
- Pathologist training

Inserting a new step into slide prep

Case delay?

- Only for onsite pathologists
- Options
 - Change laboratory staff shifts—night shift
 - Delay cases

Paper vs Paperless

Digital and Laboratory Info-System "A Relationship"

Tissue identification decreases scan size

Data Storage

One guadrillion bytes!

1 billion bytes!

- Streaming of data superior to static storage
 - 150 terabyte server at CTA Lab
 - Disc storage being added (A\$75,000)
 - Slides can be rescanned easily
 - Can keep consult slides longer

Why store images?

- Access of old cases
- Use by outside clients
- Sell data
 - Research
 - Artificial intelligence development

Internet

As fast as possible (works in wifi)
Streaming—like Netflix

Artificial Intelligence

Diagnostic Aid

Operation Summary and Clinical Information

The ThinPrep® Imaging System

Pathologist Training

Young vs Old

- Not yet confident at pathology and comfortable only at a microscope
- In a hurry
- Not yet worried about chronic use injury
- Independent

- Not computer literate
- May not know how to type
- Heading toward retirement
- Independent

Must remove the microscope from the office

Train and retrain

Quality Assurance

- College of American Pathologists (CAP) recommends
 - 60 cases for H&E comparison glass to computer read
 - 20 cases for special stains
 - 20 cases for immunohistochemistry
- Glass and computer read separated by two weeks
- Remote clients must comply

Cases to read the old way

Gram stain—no Z axis focus

Cases to read the old way

| owing case 1-111 of 1 | 11 cases matching 'ct191 | 9' in 'All cases' | | 1 case(s) selected |
|-----------------------|--------------------------|-------------------|----|---------------------------|
| 191976 | CT191976 | . 01-Jan-00 (-) | 4 | <unassigned></unassigned> |
| 25-Jan-19 10:42 | CT191976 | Other | | Finished |
| 1 91986 | CT191986 | 01-Jan-00 (-) | 4 | <unassigned></unassigned> |
| 29-Jan-19 06:17 | CT191986 | Other | | Finished |
| 191998 | CT191998 | 。 01-Jan-00 (-) | 4 | <unassigned></unassigned> |
| 28-Jan-19 09:27 | CT191998 | Other | | Finished |
| 1 91961 | CT191961 | 01-Jan-00 (-) | 5 | <unassigned></unassigned> |
| 28-Jan-19 08:58 | CT191961 | Other | | Finished |
| 19197 | CT19197 | 。 01-Jan-00 (-) | 5 | <unassigned></unassigned> |
| 04-Jan-19 11:35 | CT19197 | Other | | Finished |
| 191974 | CT191974 | 01-Jan-00 (-) | 5 | <unassigned></unassigned> |
| 28-Jan-19 08:33 | CT191974 | Other | | Finished |
| 191902 | CT191902 | 。 01-Jan-00 (-) | 6 | <unassigned></unassigned> |
| 28-Jan-19 12:23 | CT191902 | Other | | Finished |
| 191908 | CT191908 | 01-Jan-00 (-) | 6 | <unassigned></unassigned> |
| 28-Jan-19 06:34 | CT191908 | Other | | Finished |
| 191928 | CT191928 | 。 01-Jan-00 (-) | 6 | <unassigned></unassigned> |
| 25-Jan-19 13:14 | CT191928 | Other | | Finished |
| 191913 | CT191913 | 01-Jan-00 (-) | 7 | <unassigned></unassigned> |
| 28-Jan-19 06:41 | CT191913 | Other | | Finished |
| 191922 | CT191922 | 。 01-Jan-00 (-) | 7 | <unassigned></unassigned> |
| 30-Jan-19 06:22 | CT191922 | Other | | Finished |
| 191936 | CT191936 | 01-Jan-00 (-) | 7 | <unassigned></unassigned> |
| 28-Jan-19 10:32 | CT191936 | Other | | Finished |
| 191956 | CT191956 | 。 01-Jan-00 (-) | 8 | <unassigned></unassigned> |
| 28-Jan-19 07:46 | CT191956 | Other | | Finished |
| 191965 | CT191965 | 01-Jan-00 (-) | 8 | <unassigned></unassigned> |
| 28-Jan-19 08:49 | CT191965 | Other | | Finished |
| 191912 | CT191912 | 。 01-Jan-00 (-) | 10 | <unassigned></unassigned> |
| 25-Jan-19 13:39 | CT191912 | Other | | Finished |
| 191949 | CT191949 | 。 01-Jan-00 (-) | 10 | <unassigned></unassigned> |
| 25-Jan-19 13:07 | CT191949 | Other | | Finished |
| 101050 | CT101059 | 01-100-00(-) | | diagonianada |

Slide Id: 730877 Stain info:

Slide Id: 730878 Stain info:

10

E I

Slide Id: 730881 Stain info:

Slide Id: 730876 Stain info:

Slide Id: 730884 Stain info:

Slide Id: 730875 Stain info:

Slide Id: 730883 Stain info:

Slide Id: 730885 Stain info:

Blurry—small tissue

Blurry tracts

Blurry with writing on slide

A low quality H&E is still low quality scanned

Slide Labels

Summary

- Pathologist
 - Health
 - Lifestyle
 - Education
- Innovative business growth
- Implementation is complex
- At least 3 machines needed
- Useful for a majority but not all cases

Cheers! curtisinportland@gmail.com