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School of Health Professions

Clinical Laboratory Consultation
Improving Diagnosis and Reducing Cost

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Learning Objectives

- Provide evidence of the need to improve/change the delivery of clinical laboratory diagnostic services.
- Explain the Diagnostics Consultation Model© (DCM©).
- Describe the four settings of the Diagnostics Consultation Model© (DCM©).
- Using case studies evaluate the contribution of DCLS consultations in various settings related to patient safety, quality patient care and utilization of laboratory services.
- Using case studies, evaluate cost savings associated with DCLS consultation in various setting to the patient and the healthcare system.

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Issues Driving Need for Improvement in Delivery of Laboratory Services

- Rapidly expanding clinical lab test menu - new molecular methods, etc.
- Clinicians challenged to keep abreast of new diagnostic tests
- Errors in ordering and interpreting lab tests
  - Adversely affecting patient safety
  - Increasing costs
- Higher costs of health care without increase in quality/outcomes
- Need more focus on patient/consumer safety - Medical Errors
  - 3rd leading cause of death in the US; 250,000 Americans die each year
- Need more disseminate/published evidence for laboratory practices
- Need greater use of informatics to measure clinical outcomes and cost effectiveness

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The Gap Between Clinicians and the Laboratory A Short Journey……..

Centers for Disease Control and Prevention. Division of Laboratory Systems.
The 2007 Institute: Managing for Better Health. Executive Summary of Action Plan Priorities, 2007.

Explore ways of improving the integration of lab medicine within the health system….

"to institutionalize new models of clinical consultation provided by the laboratory medicine professionals to clinicians to guide their decisions about utilization of laboratory tests or services".

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Gap Between Clinicians and the Laboratory

2013: Clinical Laboratory News January 2013, Vol. 39, No.1
A Family Physician's Perspective on Laboratory Testing and Diagnostic Errors *Interview with Peter Weir, MD, MPH*
Every time I order a test of any kind, I'm very aware of the potential for ordering the wrong test for the patient's condition, as well as the fact that even correctly ordered tests have weaknesses, for example false negatives and false positives.

I have found that inexperienced clinicians, not necessarily mid-level providers, tend to over-order tests when they are uncomfortable with a clinical situation. The problem they run into, however, is the more tests that are ordered, the more interpretation of results that is needed……..Ordering panels of lab tests that are not well thought-out can generate misleading, and sometimes conflicting, results, and leads to confusion, unnecessary referrals, and patient anxiety.

If you had a magic wand to wave over the clinical laboratory, what would you change?
I would somehow bring the expertise from the clinical laboratory into our clinic. I am surrounded by physicians and scientists who have an exceptional knowledge base that I wish I could tap into at the point-of-care. No doubt, every provider has limits to his/her own knowledge, and collaboration with colleagues often leads to better care for patients.

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Gap Between Clinicians and the Laboratory

2014: Primary Care Physicians' Challenges in Ordering Clinical Laboratory Tests and Interpreting Results. *Journal of the American Board of Family Medicine March-April* 2014;27:2, 268–274.
- Experience uncertainty & challenges in ordering, interpreting diagnostic laboratory tests."
- Concerns about the safe and efficient use of laboratory testing resources
- Quick access to laboratory consultations may reduce physicians' uncertainty and mitigate these challenges.

2015: Institute of Medicine Improving Diagnosis in Health Care
- Highlighted diagnostic errors cause patient harm
- Improvement in the diagnostic process requires collaboration among physicians and laboratory professionals.

2017: **Opportunities to Enhance Laboratory Professionals' Role On the Diagnostic Team.** *Laboratory Medicine*. Vol 8. Issue1, Feb 2017
- 31,689 with 1768 (5.6%) response
- Diagnostic challenges, use electronic resources, difficult and time-consuming to contact the lab
- Only 20% had an effective way to access laboratory professionals- Mostly seeking help for logistical but less for clinical issues.
- "Laboratory professionals have an opportunity to play a greater role in the diagnostic process by becoming active members of the clinical care team, beyond providing results."

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Gap Between Clinicians and the Laboratory

2018: The Laboratorian as a Clinical Consultant: Identifying Needs and Building New Roles *Cardinal Health Webinar April 25, 2018*

Need for…….

- Clinical laboratorians to expand their sphere of influence outside the walls of the clinical laboratory
- Opportunities in institutions for expanding the professional role of clinical laboratorians
- Key clinical and administrative partners for a successful program that fully utilizes the skill set of the laboratorian
- Key areas in which laboratorians can partner with care teams to improve patient care

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10+ years later…….
Are We Meeting the Need & Filling the Gap?
The evidence speaks……..

- ASCLS Position Paper 2005, revised 2012, 2017
- DCSL Oversight Committee
- Institutions of higher education DCLS program development
- DCLS- advanced practice and research

There is a quality gap in clinical laboratory services delivery

- Mechanisms do not exist to measure/improve the value (quality/cost) of clinical laboratory diagnostics
- Traditional analytic pathway QI does not measure value for **healthcare consumers**
- The laboratorians (DCLS/CLS) can address the quality gap in a methodological manner

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Diagnostics Consultation Model©

- **Establishes a framework for DCLS to address the quality gap in clinical laboratory services delivery**
  - Defines activities related to quality and value improvement in clinical laboratory services delivery – the "practice"
  - Gathers and analyzes the evidence to determine best practices – the "research"
- **Operationalizes the practice of the DCLS**
  - DCLS as active members of interprofessional health care teams in a variety of settings
  - Consultation Model functions are consistent among other healthcare service providers
    - MD, PharmD, DNP, DCN, DPT…
  - Implementation strategies (consumer populations, provider system organization, analytics and data sources) will differ among settings

(Leibach, 2018)

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Diagnostics Consultation Model© Implementation
Four Service Delivery Settings

Patient Care Intervention (PCI)

- Daily patient-care clinical rounds - Interprofessional healthcare team
  - Clinician, residents, PharmD, DCLS, nurses, other healthcare providers

Diagnostics Management Intervention (DMI)

- Encounters received through direct case management requests to the clinical laboratory
- Interprofessional team approach
  - Pathologist, DCLS, clinicians other laboratories and healthcare providers

Utilization Review Intervention (URI)

- Encounters through review of reports generated by the LIS rules
- Interprofessional team approach
  - DCLS, pathologists, other laboratorians, clinicians, other healthcare providcers i.e. genetic counselors

Community Intervention (CI)

- Consumer information response encounters via labtestsonline.org and the ASCLS public consultation network, other community-based setting
- Interprofessional team approach

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Diagnostics Consultation Model© Implementation
The Evidence

- Using case studies the contribution of DCLS consultations in various settings related to patient safety, quality patient care and utilization of laboratory services will be demonstrated.
- Using case studies, cost savings associated with DCLS consultation in various setting to the patient and the healthcare system will be demonstrated.

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Case #1 – Patient Care Intervention (PCI)

Patient:

- 34 year old male, quadriplegic
- Tracheal ventilator dependent
- Admitted from the ER to the Cardiology service for atrial fibrillation

Inpatient Day 2

- Cardiology care team determines patient needs a pacemaker
- Procedure scheduled for AM of Day 4

Overnight of Day 2

- Resident notified
  - MSSE growth in tracheal aspirate culture obtained in ER
  - Resident prescribed 10-day course IV vancomycin
- Documents patient as having MSSE pneumonia

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Case #1

Patient Care Team – Inpatient Day 3
- Attending Physician
- Cardiology Fellow
- Resident Physicians
- Clinical Pharmacist
- DCLS Resident
- RN
- Care Coordinator

Pacemaker procedure must be postponed until IV antibiotic therapy is complete
- Requires 10 additional inpatient days

Attending physician asked the DCLS resident for opinion on culture result

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Case #1

DCLS Consult:
- Patient has a permanent trach
- Grows a bacterial biofilm overtime
  - MSSE is likely representative of this biofilm
- No growth on the BAL culture
- Chest x-rays - clear lung fields
- Vital signs do not indicate infection
- No evidence the patient has bacterial pneumonia

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Case #1

Team Conclusion:
- Patient does not have bacterial pneumonia
- Cancel antibiotic regimen
- Move forward with pace-maker placement as originally scheduled

DCLS Consultation Contributed To:
- Correct patient diagnosis
- Discontinuation of inappropriate antibiotic therapy
- Decreasing patient length of stay by 10 days
- Patient obtaining pacemaker placement in a timely manner
- Cost savings of $22,300

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Case #2- Patient Care Intervention (PCI)

Patient:
- 54 year old male
- PMH of HTN, aortic valve stenosis, and GERD

Inpatient Day 4 in Cardio-Thoracic ICU
- Post aortic valve replacement
- Extubated 20 hours earlier
- Now on full diet after 5 days NPO

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Case #2

Day 3

Lab Results
- CBC- within reference range
- CMP- with reference range, except:

Test	Result
Creatinine	1.49 mg/dL ↑
AST	54 U/L ↑
ALT	62 U/L ↑

- Acute Hepatitis Panel:
  - Non-reactive except **HCV Ab +**

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Case #2

Patient Care Team:
- Attending Physician (CT Surgeon)
- Anesthesiology Fellow
- Resident Physicians
- Medical Students
- Clinical Pharmacist
- DCLS Resident
- RN
- Pharmacy Student

Day 4 Lab Results
- CBC – within reference range
- BMP ordered, only Potassium resulted
  - Potassium 6.2 mmol/L ↑

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Case #2

Team Consult

During patient care rounds and team discussion……

- Another patient in the unit coded
- Attending, fellow, and several residents left to take coded patient to surgery

A patient care plan had not been determined for the patient

- 2nd yr. resident physician assigned to the patient remained on the unit.
- Requested the DCLS resident to assist in patient care planning.

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Case #2

DCLS Consult:

- Investigated why there were missing BMP results
- Assisted resident in locating previous test results
  - Patient was a known HCV+
  - Information not included on patient admission history & physical
  - Cancel HCV viral load
- Discussed a rhabdomyolysis case that occurred when full diet was initiated after extended NPO status
  - Rhabdomyolysis causes acute kidney injury and hyperkalemia

Suggested the following:

- Order BMP with new specimen collection
- Order CK to assess for rhabdomyolysis
- Consult with Clinical Pharmacist
  - Therapeutic strategies to reduce potassium level

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Case #2

Patient lab test results following consultation:

Test	Current Result	Previous Result
Creatinine	1.79 mg/dL ↑	1.49 mg/dL ↑
Potassium	6.4 mmol/L ↑	6.2 mmol/L ↑
CK	6,850 U/L ↑	*Not tested*

- Laboratory studies strongly suggestive of rhabdomyolysis
- Patient now complaining of muscle pain

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Case #2

DCLS consultation contributed to the following outcomes:

- Provided previous lab tests results, cancelled unnecessary testing
  - Direct cost savings of $133 for cancelled testing
- Identified issue with missing labs
- Contributed to timely patient diagnosis
  - Unknown indirect cost savings for reducing time to correct diagnosis

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Case #3- Diagnostic Management Intervention

Patient:

- 47 year old female, HIV+
- PMH:
  - 2 weeks prior, patient transported to ED by EMS
  - Complaint of non-witnessed seizure
  - Home glucometer reading of 32 mg/dL
- No symptoms documented by EMS or ED
  - CBC with reference ranges, except hemoglobin 10.4 g/dL ↓
  - BMP within reference ranges
  - Repeated POCT glucose : 76-94 mg/dL

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Case #3

ED referred patient to endocrinology for evaluation for hypoglycemia

- Endocrinology admitted patient for a 72 hour fast with:
  - Renal profile & CBC on admission
  - Renal profile every 8 hours
  - POCT glucose measured every 2-4 hours
  - Every 6 hours -
    - Plasma glucose
    - Insulin
    - Proinsulin
    - C-peptide
    - Beta-hydroxybutyrate

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Case #3

What initiated the Diagnostic Management Consultation?

Biohazard bag sent via tube system……

- Contained specimens collected over the 72-hour fasting episode

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Case #3

Admissions Lab Test Results:

- All renal profiles were within reference range limits.
- CBC with reference range, except hemoglobin of 10.0 g/dL ↓

Lab Results During 72 hour Fasting:

- All POCT glucose results ranged 74-109 mg/dL
- All serum glucose results ranged from 83-99 mg/dL

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Case #3

DCLS resident performed initial chart review:

- Computer Program Order Entry (CPOE) procedures not followed
- Samples sent at the same time were unspun and beyond acceptable specimen stability
- DCLS notified ordering physician explaining why test orders were cancelled

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Case #3

Attending Physician Response:

"It is recommended by the Mayo clinic and the endocrine society hypoglycemia guidelines 2009 that hypoglycemic labs (insulin, proinsulin etc.) be drawn every 6 hours while a patient is undergoing a 72 hour fast in house. This is the standard of care."

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Case #3

Initiation of Diagnostic Management Team (DMT)

DMT Members:

- Pathologist
- Pathology Resident
- Laboratory Department Manager
- DCLS Resident
- Medical Librarian

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Case #3

DCLS requested Medical Librarian to search for the guideline cited by physician

Guideline states patients should undergo 72-hour fast if:

- Exhibit Whipple's Triad
  - Signs & symptoms consistent with hypoglycemia
  - Low plasma glucose concentration
  - Documentation of symptom resolution after plasma glucose is raised
  - "drugs, critical illnesses, hormone deficiencies, and non-islet cell tumors" have been evaluated first

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Case #3

DMT concluded:

- Guideline did not apply to this patient
- Whipple's triad criteria was not met
- Entire admission was not medically necessary
- No follow-up on anemic patient that had 96 tubes of blood drawn

Outcome – Policy Change…….

Pathologist contacted patient's physician & Medical Director of Endocrinology:

- ***All future admissions for 72 hr. inpatient fasting hypoglycemia protocol must have pathology approval prior to admission***

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Case #4
Diagnostic Management Intervention

Patient:

- 14 week old male
- Mom checked on infant in his crib in the middle of night
- Noticed something was "off"
- Spontaneous subdural hemorrhage
- Outside hospital transferred baby under suspicion of shaken baby syndrome
- Social Service and Child Protective Services assigned to infant

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Case #4

Resident physician contacted DCLS resident requesting assistance:

- States family doesn't fit the profile for child abuse
- Asked…….
  - What coagulopathies could explain infant's presentation?
  - Which tests to order with minimal blood volume due to bleeding?

- Patient going to neurosurgery now
  - Will likely need blood transfusion later in day

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Case #4

Emergency DMT activated……

Team members:

- Pathologist
- Pathology Resident
- DCLS Resident
- Hematology/Coagulation Manager

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Case #4

Team reviewed :

- Available medical records & limited family history
- Listed non-trauma differential diagnoses
- Diagnoses ranked most probable to least probable

Testing prioritized

- Limited volume available to test
- Transfusion would make further testing not accurate

- Patient specific testing algorithm was agreed upon
- DCLS Resident coordinated testing with PICU patient care team

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Case #4

Laboratory test results:

	Test	Results
Initial Testing	PT	10.9 sec
	PTT	74.8 sec. ↑↑
2nd Level of Testing	Factor VIII activity	<1% ↓↓↓
	Factor IX activity	44%
3rd Level of Testing	vWF antigen	73%

Diagnosis: Severe Hemophilia A

- Diagnosis obtained within 5 hours of baby leaving the OR

- Sufficient diagnostic information obtained to stabilize & treat appropriately

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Case #4

- Pathologist contacted Child Protective Services and Social Worker
- DCLS resident contacted with patient care team

Both communicated:

- This was an inherited condition of most severe form
- Spontaneous bleeding common in first year with severe hemophilia A
- Life-time treatment regimen will be necessary
- Bleeding episodes still likely to occur
- Genetic testing at a later date (outpatient)

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Case #4

DMT Consultation Outcomes:

- Rapid accurate diagnosis obtained with minimal testing
- Correct patient management initiated in a timely manner
- Prevented a child from entering foster care unnecessarily
- Prevented false charges of child abuse against a parent

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Cost Savings & Other Outcomes

- Total cost savings from DCLS consultations:
  - $628,493 over 9 ½ months (documented)
- Multiple requests from physicians to join their patient care rounding team on a regular/daily basis
- Requests from medical staff leadership committee
  - Monthly physician continuing education
  - Expand patient rounding team consultation

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Conclusions

DCLS consultations contribute to:

- Improve time to correct diagnosis
- Decrease inappropriate test ordering
- Increase correct test interpretation
- Improve patient safety
- Decrease healthcare costs

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