Improving Laboratory Productivity

Defining, Assessing, and Improving the Labor Productivity of Your Laboratory:
Session 3

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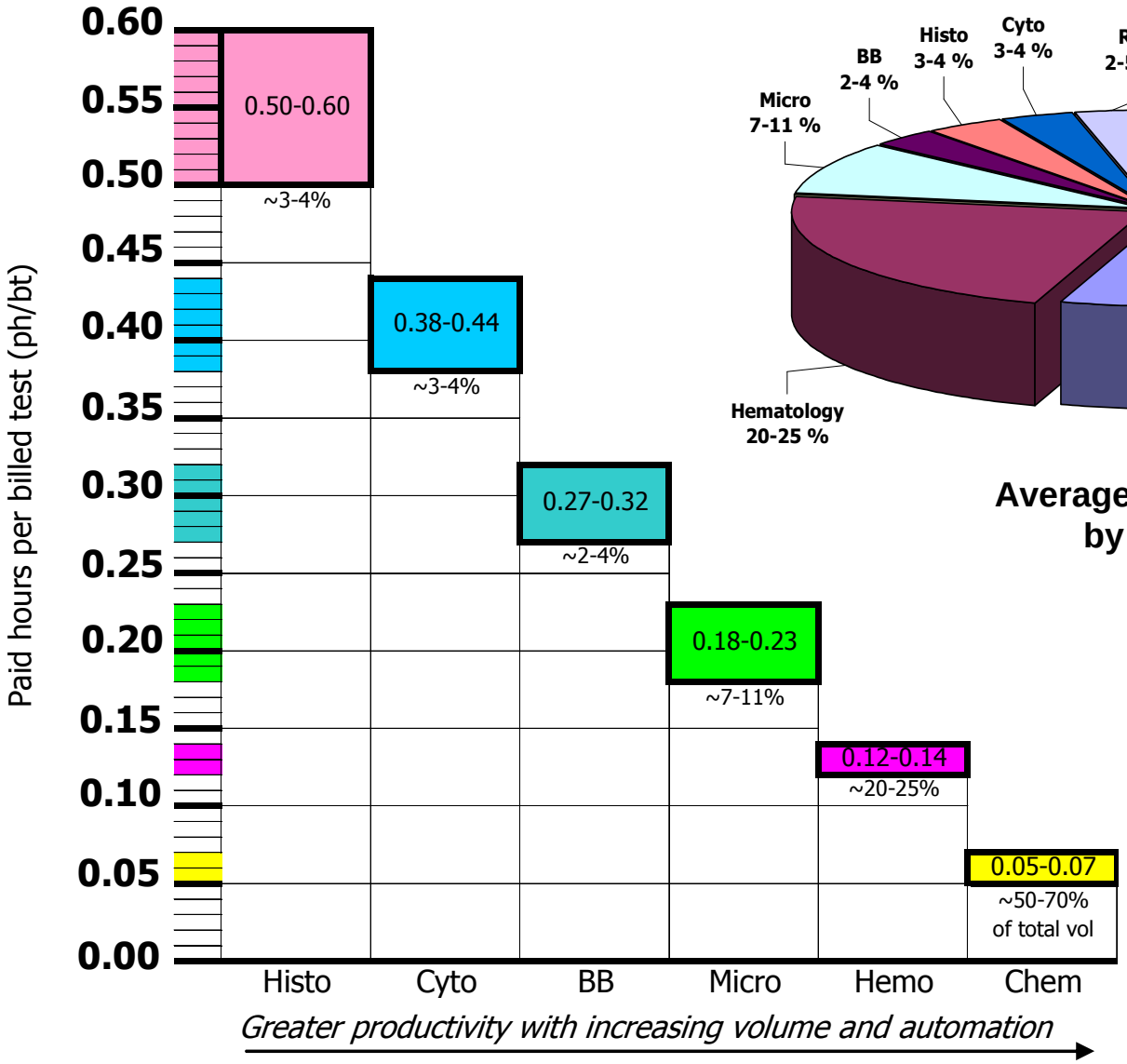
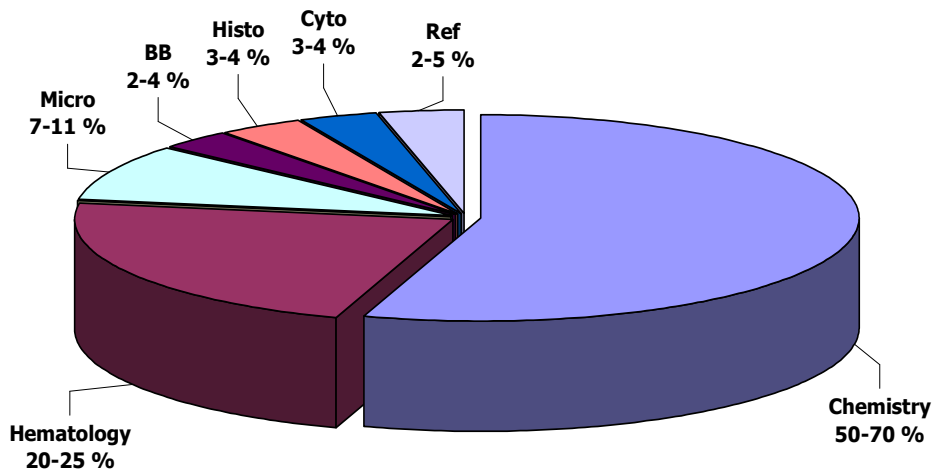
Session 3: Agenda

- Departmental Productivity
  - Administration and Support
    - Management
    - Phlebotomy
    - Specimen Processing
    - Other Functions
  - Chemistry
  - Hematology

Productivity Ranges by Lab Section





Average test distribution by lab section

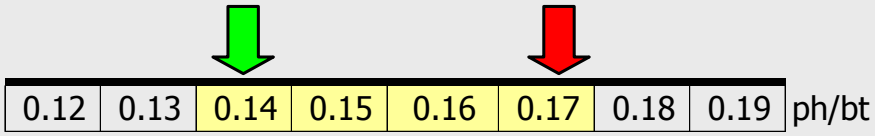
Departmental Productivity

- Cardinal Rules for Sectional Productivity Analysis *(calculating accurate ph/bt)*

1. ***Allocate staff based on where work is performed***
   - Evening/night shift should be allocated based on workstation assignments and volume estimates
     - If they cover phlebotomy, account for the activity
2. ***Ensure billed test volume by section is accurate***
   - Separate the send-out volume

Target Productivity

- The appropriate target productivity for ***YOUR*** lab is based on the mix of factors that enhance or impair productivity



- Highly automated, efficient operations utilizing best practices can achieve the lowest ph/bt ratios (highest productivity), at or below the benchmark range

- Operations that provide specialized services or require manual tasks outside the lab's control may need to operate at or above the benchmark range

Departmental Productivity

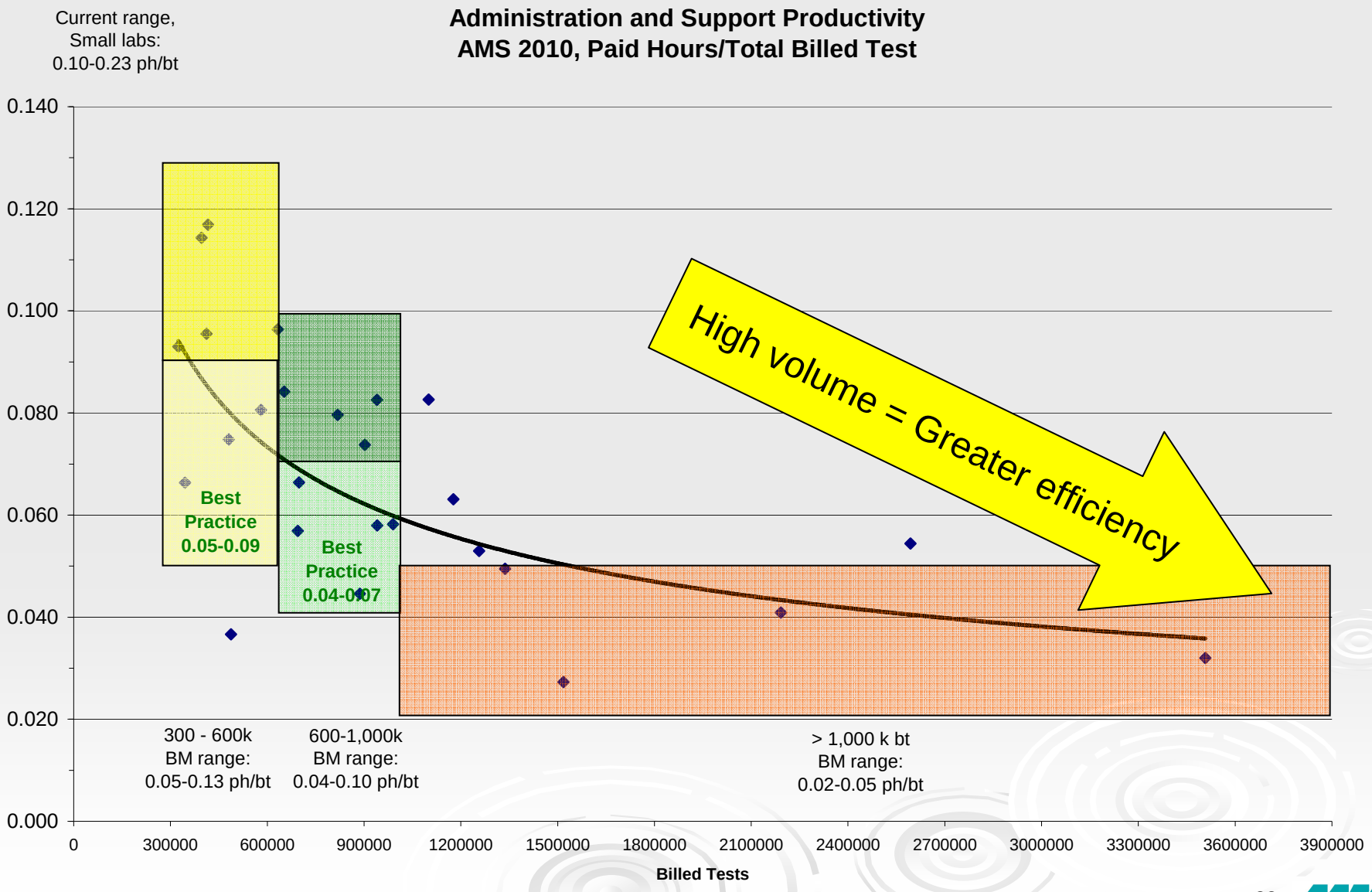
- Administration and Support
  - Functions ***included*** in benchmark
    - Management and Supervision
      - Administrative Director
      - Managers (multiple depts., system-wide)
      - LIS Coordinator
      - Point-of-Care Testing (POCT) Coordinator
    - Phlebotomy
    - Specimen processing
    - Reference lab processing
    - Other clerical: Front desk/reception, report distribution

Administration and Support

- Functions ***not included*** in benchmark
  - Couriers
  - Educational Coordinator
  - Expanded POCT program
  - Outreach Program
    - Sales and Marketing
    - Billing service
    - Patient registration
    - Phlebotomy other than a hospital drawing station
    - Dedicated Client Services (Call Center)
  - Pathology transcription and clerical support

These functions require customization of the benchmark

Administration and Support



Administration and Support

- Benchmark ranges

300,000-600,000 bt

Best Practice Target

35-45% of total FTEs

0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	ph/bt

Benchmark Range
0.05 - 0.13 ph/bt

600,000-1,000,000 bt

Best Practice Target

30-40% of total FTEs

0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	ph/bt

Benchmark Range
0.04 - 0.10 ph/bt

> 1,000,000 bt

0.01	0.02	0.03	0.04	0.05	0.06	0.07	ph/bt

Benchmark Range
0.02 - 0.05 ph/bt

25-35% of total FTEs

Front-end automation;
Electronic reporting;
CS may be in Outreach;
IS may be centralized

Management

- Typical management structure reflects
  - Administrative Director
  - Technical supervisors (paid in technical cost centers)
  - Support supervisor(s)
- Large labs may include
  - Operations Manager
    - Dependent upon size and scope of operations
  - System-wide managers responsible for multiple sites
  - Quality/Compliance

Management

- Span of Control
  - AMS recommended ranges
    - VP/Director: 8-12 direct reports
    - Manager/Supervisor: 10-20 direct reports
  - As the number of direct reports increases, support positions are necessary (Senior/Lead Techs)
- Best Practices
  - Promote system-wide technical oversight for uniform operations: Equipment, methods, procedures
  - Align incentives and skills
    - Automated lab consolidation
    - Oversight of Core lab + Processing
  - Cross-train staff: Support and Technical

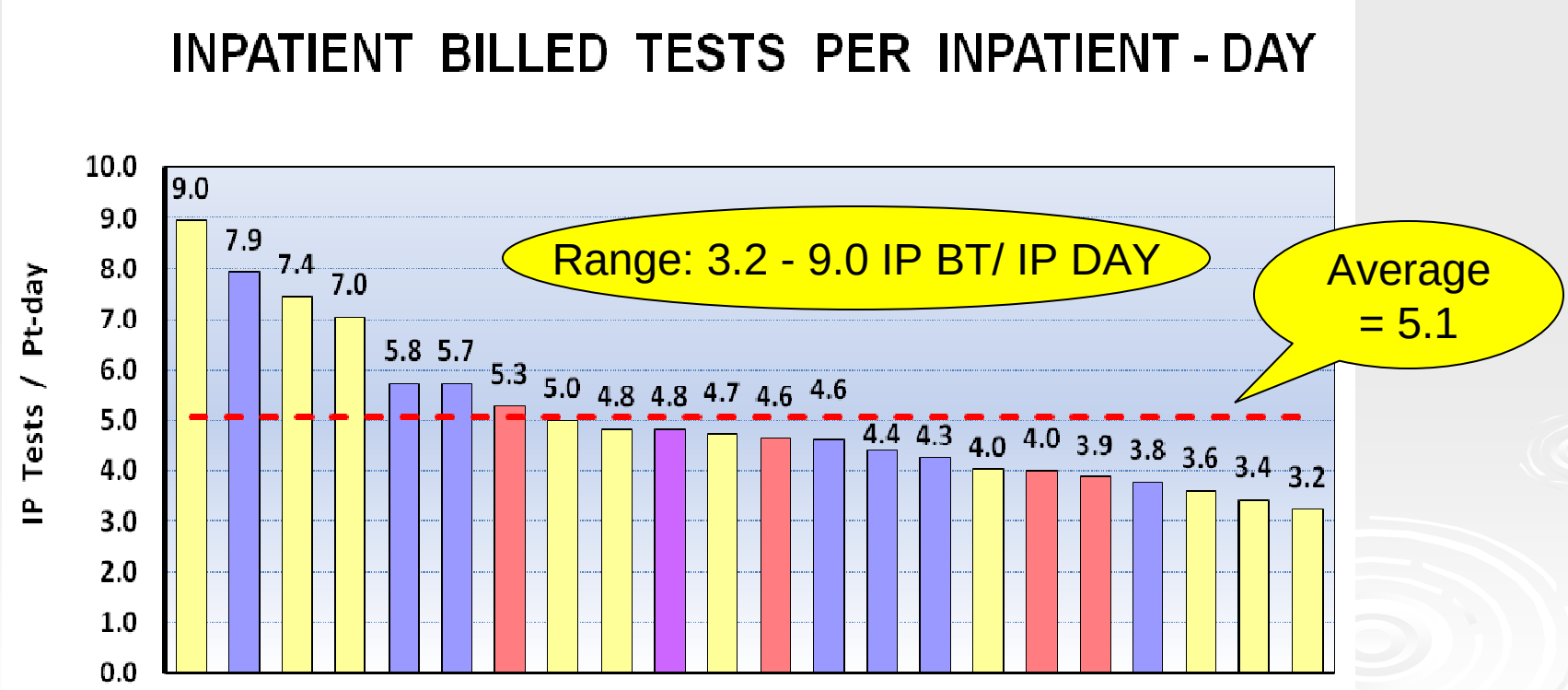
Phlebotomy

- Inpatient phlebotomy
  - Target 5 - 6 venipunctures / hr / FTE
    - 0.22 - 0.27 ph/IP venipuncture based on 85% productivity
  - Best Practices
    - ED staff responsible for own specimen procurement
    - Scheduled inpatient phlebotomy rounds
    - Positive patient identification (PPID) systems

  - Factors affecting productivity
    - Geography
    - Minimum staffing on off-shifts or of multiple locations
    - Patient population
      - Oncology (difficult draws or central lines)
      - Neonates requiring heelsticks

Phlebotomy

- IP test utilization will impact phlebotomy staffing levels
  - Survey of 22 hospitals in May 2009
  - Average IP billed tests/inpatient day: 5.1



Phlebotomy

- Outpatient Phlebotomy
  - Outpatient (PSC) phlebotomy target
    - Target 8-10 venipunctures / hr / FTE
      - 0.13-0.16 ph/OP venipuncture based on 85% productivity
  - Factors affecting productivity
      - Minimum staffing
      - Large volume of heelsticks
    - Nursing Home phlebotomy
    - Home draws

Affected by travel time and service level demands

  - Best Practices
    - Single-patient processing/label printing

Automation in Phlebotomy

- ***Minimize errors and risk, improve patient safety, eliminate the re-work associated with the error***

  - ***Now:*** PPID with handheld scanning and bedside barcode label printing

  - ***Future:*** A German company called PVT has placed over 1,000 automated units called the BC Robo throughout Japan
    - This automated system prepares the collection supplies for the phlebotomist, selecting and bar-coding tubes and supplies required for individual patient orders

Specimen Processing

- Target: 100,000 – 125,000 bt/FTE
  - Excludes patient registration
- Factors Affecting Productivity
  - Lab section in which poor workflow has greatest impact
    - Impacts operations of ***all*** technical areas
    - Physical layout: Workflow, walkspace vs. workspace
    - Consider how specimens arrive: pneumatic tubes, inpatient drop-off, outpatient phlebotomy, couriers, nursing homes
  - Mix of samples that are pre-processed (labeled and spun from PSCs) versus unprocessed Outreach samples
  - Scope of services typically affected by size of lab
    - Reception; phone support; report distribution

Specimen Processing

- Best Practices
  - Specimen processing/labeling performed at off-site PSCs
  - Central receiving and processing area
    - Workflow that eliminates handoffs, bottlenecks and re-work
    - Consistent processes on all shifts
  - Single requisition processing for Outreach specimens
    - Registration, order entry, barcode labeling
    - Improves flow into lab (Lean processing) and eliminates batching
  - Expedite specimen distribution
    - Use a ‘sweeper’ position
    - Minimize the number of lab distribution points
    - Ensure the distribution points are highly visible

Specimen Processing

- Best Practices (cont.)
  - Effective audit process for quality review of both demographics and orders
  - Real-time scanning of requisitions
  - Front-end automation (centrifugation, aliquotting) and refrigerated stockyard *(decision is volume driven)*
  - Electronic Medical Record (EMR) connectivity for physician office order entry and reporting

Reference Lab Processing

- Benchmark: 0.09-0.11 ph/reference lab bt
  - Per CPT code, not per order code
- Reference tests: 2 – 5% of total lab bt volume
- Best Practices
  - Centralized processing
    - Exceptions: Micro Inf. Disease to State lab; Ab ID from Blood Bank
  - Bi-directional interface to reference labs
    - Autoverification
  - Consolidated reference labs to minimize handling and maximize contract pricing: Primary vendor >85%
- ***Case Study:*** *High volume lab with 2.8 million billed tests*
  - 7.4% send-outs
  - $3.1 million/year
  - 54 reference labs

Primary reference lab:
82% of total send-out volume
55% of reference lab expenses

Other Administrative and Support Functions

- LIS
  - Guideline: 1.0 FTE for every 1,000,000 bt
    - Dependent upon Outreach program and connectivity issues
    - Hardware and connectivity support usually provided by hospital IS
    - Systems and hospitals with large Outreach programs may have all IS support consolidated in a cost center outside the lab
- Point-of-Care Testing
  - 1.0 FTE for high-level oversight of POCT in a community hospital
  - Additional FTEs required for large programs and those including extensive training responsibility and/or physician office oversight
  - Best Practice
    - Connectivity between instruments and LIS (RALS)
- Client Services
  - 80-100 calls/FTE representative/day
  - Best Practice
    - Automated Call Distribution (ACD) system and/or Problem Tracking software used in high-volume call centers

Chemistry

0.03	0.04	0.05	0.06	0.07	0.08	0.09	ph/bt

AMS Benchmark Range
0.05 - 0.07 ph/bt

- 50-70% of total bt volume
  - Typically includes automated chemistry and immunochemistry, and some specialized testing such as immunology, electrophoresis, blood gases, HPLC (A1c)
- Highly automated labs can achieve productivity lower than 0.05 ph/bt
  - Consider if processing staff responsible for receiving specimens and loading onto line with front-end automation are included in chemistry staffing

Factors Affecting Productivity: Chemistry

- Critical volume to fill staffing capacity (Small labs)
- Specimen handling
  - How are these issues managed, with and without Total Lab Automation systems?
    - Receive specimens into LIS
    - Handling multiple tube sizes
    - Stat handling
    - Handling of specimens already centrifuged
    - Decapping, recapping, aliquoting
    - Clot detection, pediatric sample handling
    - Refrigerated storage and retrieval systems

Siemens LabCell

Literature citation: *Selecting Automation for the Clinical Chemistry Laboratory.* Melanson, S,Lindeman, N, Jarolim, P. Arch Pathol Lab Med , 2007; 131: 1063-1069

Factors Affecting Productivity: Chemistry

- Workstation design
  - Consider flow and workstation coverage in physical layout
    - "Creativity before Capitalization"
      - Critical analysis required; don't automate inefficiency
      - Solve the workflow problems first
        - What % of specs arrive barcoded? Are they correctly applied?
      - get as much efficiency as possible from the current system; decrease handoffs - *then automate*
    - Off-shifts with cross-trained staff
    - Location of back-up analyzers
    - High volume analyzers closer to Receiving; low volume or manual, batch testing at the perimeter
  - Number of workstations will affect productivity
    - Routine chemistry & immunochemistry consolidation
    - Esoteric testing may increase workstations
    - Right-size' the equipment for the setting (RRL vs. Core lab)

Factors Affecting Productivity: Chemistry

- Autoverification lightens workload
  - Reduces number of tedious tasks
  - Provides more time to spend on difficult cases, reading diffs, troubleshooting
  - May improve quality (especially in high volume labs)
    - Eliminates fatigue; expert systems scan more consistently
- POCT management
  - Computerize downloading
- Unique Demands
  - Multiple sites: OR/Cardiac Lab, ABG labs

Autoverification Citations

- Implications for autoverification in the clinical lab
  - Pearlman, ES, Bilello, L, et al. CLMR 2002 Jul-Aug; 16(4):237-9
- Evaluation of rule-based autoverification protocols
  - Crolla, LJ, Westgard, JO. CLMR 2003 Sep-Oct; 17(5): 268-272
- Process improvement and operational efficiency through test result autoverification
  - Torke, N, Boral, L, Nguyen, T, Perri, A, Chakrin, A. Clin Chem. 2005; 51(12):2406-2408
- Autoverification: Making It Work For You
  - J. Johnson, D. Stelmach, Bon Secours HealthPartners Laboratories, Richmond, VA. AACC Teleconference, September 13, 2006
- Autoverification of Clinical Laboratory Test Results: Approved Guideline
  - CLSI. 2006; 26 (32)
- Roadmap to Autoverification
  - Pfeiffer, G, Demydowich, W, Dean, P. Advance Admin Lab 2010; 19 (1):28

Chemistry Sample Staffing – Moderate Volume

Your Hospital

Current Staffing Pattern - Pathology & Laboratory Medicine

Chemistry

Maximum Capacity: N/A

Annualized Billable Tests: 398,883

Area	Skill Mix	Time	Shift Length (hours)	Number of Staff Mon	Tue	Wed	Thur	Fri	Sat	Sun	Replacement Factor	Paid Hours per Week
Management	Supervisor		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
Days	1. Processing, spinning, phones, ref lab		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	2. Dimensions 1 & 2 (mirror images)		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	3. Dimension 3 (C3, C4, TDM, Igs, Li, etc)		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	4. EIA: heps, HIV (will become Centaur)		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	5. Electrophoresis, sendouts, VIDAS		8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
Weekend - Days	1. Processing		8						1.0	1.0	1.10	17.6
	2. Dimensions and other testing		8						1.0	1.0	1.10	17.6
Evening	1. Chem: Processing	230-1100	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.20	67.2
	2. Chem-Testing	230-1100	8	1.0	1.0	1.0	1.0	1.0			1.20	48.0
Eve Mgt	3. Super coverage											23.1
Overnight	1. Chem, UA	1100-700	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6

Total Weekly Paid Hours (total worked plus replacement hours): 475.1

Total Annual Paid Hours 24,706

Total Paid FTEs (total worked plus replacement FTEs): 11.88

Paid Hours per Billable Test 0.06

Benchmark Range : 0.05-0.07

1. 6.9 Days; 5.0 Eves/Nites
2. Pos Ctrl Days = 7.00; LDR = 6.88
3. No vacancies

Without processing, productivity = 0.05 ph/bt

Chemistry Sample Staffing – High Volume

Annualized Billable Tests: 1,565,466

Area	Skill Mix	Time	Shift Length (hours)	Number of Staff Mon	Tue	Wed	Thur	Fri	Sat	Sun	Replacement Factor	Paid Hours per Week
DAYS	Supervisor	730A-4P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
Weekdays	Advia 2400 - #1	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.14	45.7
	Advia 2400 - #2	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Centaur	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.14	45.7
	Centralink	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.14	45.7
	Loading SIQ	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.14	45.7
	Variant/TDM/ANA	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Aliquot	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Liaison	7A-330P	8	1.0		1.0		1.0			1.00	24.0
	Immulite 2500	7A-330P	8		1.0		1.0				1.00	16.0
	ABG	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.14	45.7
	Electrophoresis	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
Weekends	Advia 2400	7A-330P	8						1.0	1.0	1.14	18.3
	Centaur	7A-330P	8						0.9	0.5	1.14	12.8
	Centralink	7A-330P	8						1.0	0.5	1.14	13.7
	Variant/TDM/ANA	7A-330P	8						0.1		1.14	0.9
	Aliquot	7A-330P	8						0.3	0.3	1.14	5.5
	ABG	7A-330P	8						0.7	0.7	1.14	12.8
EVENINGS	Advia 2400	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.14	54.8
	Centaur	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.14	54.8
	Centralink	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.14	54.8
	ABG	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.14	54.8
NIGHTS	Advia 2400	Variable 8-10hrs	10	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.14	[illegible]
	Centaur	Variable 8-10hrs	10	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.14	[illegible]
	Centralink	Variable 8-10hrs	10	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.14	40.0
	ABG	Variable 8-10hrs	10	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.14	40.0
				Additional coverage hours to tie out to LDR								54.8

Total Weekly Paid Hours (total worked plus replacement hours): 966.3

Total Annual Paid Hours 50,247

Total Paid FTEs (total worked plus replacement FTEs): 24.16

Paid Hours per Billable Test 0.03

Benchmark Range : 0.05-0.07

Highly productive

1. Lab employs 3 Assistant Supervisors
2. Replacement time = 14.2% based on non-productive time shown in Chem LDR.
3. LDR actual = 29.35 FTEs; budget = 29.55

Hematology

0.10	0.11	0.12	0.13	0.14	0.15	0.16	ph/bt

AMS Benchmark Range
0.12 - 0.14 ph/bt

- 20-25% of total bt volume
  - Typically includes cell counting, coagulation, urinalysis and some serology testing (heterophile, RA, RPR)
- Highly automated labs often achieve productivity lower than 0.12 ph/bt
- Best Practice: <20% manual differentials
  - Unless unusually high volume of oncology patients

Factors Affecting Productivity: Hematology

- Percentage of esoteric / manual testing
  - Manual screens & manual differentials (full) (< 20%)
  - Cell counts (CSF, body fluids)
  - Flow cytometry
- Instrument choice
  - WBC discrimination; slides for every CBC?
- Automated slide staining
- Workstation design: Routine hematology, coagulation, urinalysis
- Manual microscopics on every urine?
- Autoverification

Hematology Sample Staffing – Low Volume

Your Hospital

Current Staffing Pattern - Laboratory

Hematology

Average Daily Census	422.7
Maximum Capacity:	N/A
Annualized Billables:	154,300

Area	Skill Mix	Time	Shift Length (hours)	Number of Staff Mon	Tue	Wed	Thur	Fri	Sat	Sun	Replacement Factor	Paid Hours per Week
Mgt	Clinical Specialist	6:30 - 15:00	8	1.0	1.0	1.0		1.0			1.00	32.0
Staff	Hem tech: Coulter /manuals	6:30 - 15:00	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6
	Hem tech: Differentials	6:30 - 15:00	8	0.5	0.5	0.5	0.5	0.5			1.10	22.0
	Hem tech: Coag/Urines	6:30 - 15:00	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.09	61.0
Evenings	Hem tech: Coulter/diffs	Eve	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6
	Hem tech: Coag/Urines	Eve	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6
Nights	Hemo and Coag	Night	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6

Total Weekly Paid Hours (total worked plus replacement hours):	361.4
Total Annual Paid Hours	18,795
Total Paid FTEs (total worked plus replacement FTEs):	9.04
Paid Hours per billable	0.12
Benchmark Range :	0.12 - 0.14

Notes:

Hematology Sample Staffing – High Volume

Annualized Billable Tests: 560,177

Area	Skill Mix	Time	Shift Length (hours)	Number of Staff Mon	Tue	Wed	Thur	Fri	Sat	Sun	Replacement Factor	Paid Hours per Week
DAYS	Supervisor	730A-4P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
Weekdays	Differentials	7A-330P	8	2.0	2.0	2.0	1.0	2.0			1.00	72.0
	Setup	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	LHs	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Coag	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Float	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Special Hem, fluids: G6PD, sickle cell, mono, sp stains, BMs	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	40.0
	Hgb electro/HPLC	7A-330P	8		1.0			1.0			1.00	16.0
	Special coag/LUP	7A-330P	8	1.0		1.0	1.0				1.00	24.0
	Flow cytometry	7A-330P	8	1.5	1.5	1.5	1.5	1.5			1.00	60.0
	Urines	7A-330P	8	1.0	1.0	1.0	1.0	1.0			1.00	
	Tech paid from Faculty Practice Plan (not in LDR)		8	1.0	1.0	1.0	1.0	1.0			1.00	
	Contract agency staff not in LDR		8	1.0	1.0	1.0	1.0	1.0			1.00	
Weekends	Float		8						3.0	3.0	1.10	
EVENINGS	Diffs & fluids	3P-1130P	8	2.0	2.0	2.0	2.0	2.0	0.5	0.5	1.10	
	LHs & setup	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.10	
	Coag	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.10	52
	Urines	3P-1130P	8	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.10	52.8
NIGHTS	Diffs & fluids	11P-730A	8	0.67	0.67	0.67	0.67	0.67	0.67	0.67	1.11	41.5
	LHs & setup	11P-730A	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.10	61.6
	Coag	11P-730A	8	0.67	0.67	0.67	0.67	0.67	0.67	0.67	1.10	41.3
	Urines	11P-730A	8	0.66	0.66	0.66	0.66	0.66	0.66	0.66	1.10	40.7

Total Weekly Paid Hours (total worked plus replacement hours): 1,025.0

Total Annual Paid Hours 53,301

Total Paid FTEs (total worked plus replacement FTEs): 25.63

Paid Hours per Billable Test 0.10

Benchmark Range : 0.12-0.14

Highly productive; Recommended addition of 1.0 FTE on 1st shift

1. Lab employs 3 Assistant Supervisors
2. Flow cytometry perfd in Hemo; 1 FTE pd by faculty practice plan to support this effort; not in LDR
3. 1 FTE pd as contract agency but budgted in expense budget; not in LDR.

Best Practice: Core Lab

- Integrated operations of automated testing areas
- Managed by one supervisor and staffed with cross-trained techs
- Includes Chemistry and Hematology

0.06	0.07	0.08	0.09	0.10	0.11	0.12	ph/bt

AMS Benchmark Range
0.08 - 0.10 ph/bt

- May include Blood Bank or some Microbiology
- Productivity and benchmark range will be affected by test mix