# POCT Applications

- Two examples – areas of growth and interest
  - Coagulation
  - Tight glycemic control (TGC)

# POCT Coagulation

- Increasingly used in the hospital and outpatient settings.
- Primary uses:
  - Anticoagulation monitoring during cardiopulmonary bypass (CPB) surgery
  - Cardiac catheterization
  - Anticoagulation monitoring in the outpatient setting

# POCT Coagulation

- Primary uses (continued):
  - Guidance of transfusion therapy in surgery
  - Monitoring/assessment of anti-platelet therapy
  - D-dimer in the assessment of pulmonary emboli (PE)

# POC Coagulation Tests

- ACT
- PT-INR
- D-dimer
- Platelet function
- Thromboelastography (TEG)

# ACT

- Used to monitor heparin administration during CPB surgery, cardiac catheterization, hemodialysis, ECMO
- Two main assays:
  - Celite
  - Kaolin
- Heparin administration
  - Moderate (1-2 units/mL)-cath lab, hemodialysis, ECMO
  - Low dose (<1 unit/mL)-DVT, post-cardiac cath

# POCT - ACT

- Problems with ACT:
  - Variability in dose-response among patients
  - Inter-instrument differences
  - Reagent differences (kaolin, celite, mixtures)
  - Hematocrit and temperature effects
  - Aprotinin effect
  - No “equivalent” laboratory test

# POCT - PT INR

- Increasingly used in outpatient setting
  - Anticoagulation clinics for adjusting warfarin therapy while patient waits
- Other sites:
  - Primary care clinics
  - Physician office
  - Skilled nursing facility (Nursing Homes)

# POC INR Monitors

- Varying thromboplastins and endpoint detection methods
- Designed to use capillary whole blood
- Designed primarily for patient use
- Data management capabilities to enhance professional use just starting to be available

# POC INR Monitors

| Make | Model | Prof. use | Pt. use | Low ISI | Int. QC |
|---|---|---|---|---|---|
| Roche | CoaguChek Classic (no longer made) | Y | Y | Y | N |
| | CoaguChek S | Y | N | Y | N |
| | CoaguChek XS | Y | Y | Y | Y? |
| | CoaguChek XS Plus | Y | N | Y | Y? |
| ITC | ProTime | Y | Y | Y | Y |
| | Hemochron Jr. Signature | Y | N | Y | N |
| Hemosense | INRatio | Y | Y | Y | Y |
| Abbott | i-STAT | Y | N | Y | Y? |

Santrach P. Presentation Charleston SC 2007

# Self-Monitoring of Oral Anticoagulation: a systematic review and meta-analysis

- 14 randomized trials with a total of 3049 participants comparing self-monitoring with routine anticoagulation
  - Primary care as control group: 8
  - Anticoagulation clinic as control group: 6

Henaghan C et al Lancet 367:404, 2006

# Self-Monitoring of oral anticoagulation: a systematic review and meta-analysis

- Self-monitoring associated with a higher rate of testing (weekly vs monthly)
- Not feasible for all individuals
  - Physical limitations
  - Training issues
    - Attendance
    - Failure
  - Device problems

Heneghan C, et al. Lancet 367:404, 2006

# D-dimer

- PE = Pulmonary Embolism
- DVT = Deep Vein Thrombosis

# POCT – D-dimer

- Used to rule in/rule out PE and DVT
- Mortality of PE as high as 30% without treatment; can drop to 2% if treated promptly
- A thrombus is broken into fragments containing D-D bonds, D-D-E bonds, E-D-D-E bonds; may result in emboli in heart, lungs, carotid artery
- Diagnostic procedures invasive (e.g. venography); expensive and carries risk

# Increases in D-dimer

- Disseminated intravascular coagulation
- Trauma
- Post-surgery
- Hematoma
- Arterial thrombosis
- Venous thromboembolism
- Pregnancy
- Cancer
- Diabetes
- Thrombolytic therapy
- Older age
- Generalized hospitalized patient

# Types of D-dimer Assays

- ELISA (gold standard)
- Quantitative rapid ELISA
- Semi-quantitative rapid ELISA
- Qualitative rapid ELISA
- Quantitative latex agglutination assay
- Semi-quantitative latex agglutination assay
- Whole blood agglutination assay

# D-dimer for Pulmonary Embolism

| *Test* | *Sensitivity* | *Specificity* | *Positive LR* | *Negative LR* |
|---|---|---|---|---|
| ELISA | 0.95* | 0.44 | 1.68 | 0.13 |
| Quant rapid ELISA | 0.95* | 0.39 | 1.56 | 0.13 |
| Semi-quant Rapid ELISA | 0.93* | 0.36 | 1.45 | 0.20 |
| Qual rapid ELISA | 0.93 | 0.68 | 2.92 | 0.11 |
| Quant latex | 0.89 | 0.45 | 1.62 | 0.24 |
| Semi-quant Latex | 0.92 | 0.45 | 1.68 | 0.17 |
| Whole blood | 0.78 | 0.74 | 2.93 | 0.31 |

Ann Intern Med 140:589-602, 2004

# D-dimer for Pulmonary Embolism

- Positive Likelihood Ratio
  - Large & often conclusive change from pre- to post-test probability if >10
  - Not helpful if 1-2
- Negative Likelihood Ratio
  - Large & often conclusive change from pre- to post-test probability if <0.1
  - Not helpful if 0.5 – 1.0
  - ELISA assays comparable to NLR for a normal to near normal lung scan (0.10)

Ann Intern Med 140:589-602, 2004