POST-MARKET STUDIES OF DEVICES FOR SCREENING AND DIAGNOSIS

Evaluating Effectiveness of *In Vitro* Diagnostics

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TYPES OF IN VITRO DIAGNOSTIC (IVD) TESTS

Quantitative, qualitative or semi-qualitative

Screening

- Test blood donors for infectious disease (HIV, Hepatitis)

Diagnostic

- Troponin-I to aid in diagnosis of acute myocardial infarction

Monitoring

- Monitor prostate-specific antigen levels for response to therapy

Companion (Diagnostic or Prognostic)

- Detect amplification of HER-2/neu gene from breast cancer patients to aid in identifying patients eligible for treatment with HERCEPTIN®
- Genetic test to predict likelihood of developing future condition

SETTINGS FOR IVD TESTING

Clinical laboratory

- Often large, automated devices requiring skilled technicians
- Labs report results back to ordering physician

Near patient (eg, doctor's office, emergency room)

- Bench-top or hand-held point-of-care devices
- Deliver fast results for preliminary diagnosis

Home use

- Designed for individuals to use themselves (eg, pregnancy test or glucose monitor)
- Require less skilled training than devices in other settings

SOURCES OF IVD RESULT VARIABILITY

Biological

- Biological variability with-in patient, site of specimen collection (finger prick, heel stick), time of day, fasting vs. non-fasting

Pre-analytical

- Specimen collection, handling and processing

Analytical

- Technological capability of the test method (immunoassay vs. clinical chemistry assay, ELISA vs. HLPC)

MEASURES OF IVD EFFECTIVENESS

Accuracy

- Qualitative assays – Clinical sensitivity and specificity
- Quantitative assays
  - Monitoring: How well does test correlate to response to therapy?
  - Prognostic: How accurately does test predict patient likelihood of disease?

Other measures

- Does test result affect treatment and is treatment more effective due to knowing test result?
- Does test reduce clinician's diagnostic uncertainty, even if patient management unaffected regardless of test result?
- Does knowing test result reduce patient anxiety, even if treatment unavailable?

IVD POST-MARKET EVALUATION CHALLENGES

Accuracy

- Qualitative screening assays – subjects who tested negative for disease are not followed up, so would not know if test had a false negative result
  - Difficult to obtain unbiased measures of sensitivity and specificity
- Quantitative assays – many are not standardized
  - Cannot compare results from one products to another
  - Cutoff or reference values differ
- Difficult to correlate patient outcome, treatment, therapy with test results
  - Lab data not always linked to clinical data
  - Lab data does not always identify exact product (manufacturer, instrument) used
  - For prognostic assays, may have large time gap between initial test and development of condition

IVD POST-MARKET EVALUATION CHALLENGES

Other measures

- Does test result affect treatment and is treatment more effective due to knowing test result? – Can be measured for certain cases (eg, gene identification)

- Does test reduce clinician's diagnostic uncertainty, even if patient management unaffected regardless of test result? – How to measure this?

- Does knowing test result reduce patient anxiety, even if treatment unavailable? – How to measure this too?

BENEFITS AND RISKS REGARDING IVD USE

Are benefits of test worth the cost?

Consider:

- Time for patient and health care providers to obtain and test specimen
- Potential patient anxiety while waiting for results
- Follow-up risks and costs
- Patient peace of mind even when no treatment options available
- Test may reduce clinician's diagnostic uncertainty, even if patient management unaffected by test result

REFERENCES

- Fang C, Hansel JO, Greenberg D, Neumann PJ. Cost-Utility Analyses of Diagnostic Laboratory Tests: A Systematic Review. Value in Health 2011;14:1010-1018.

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Thank You

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