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Introduction

- **Pharmacogenomics**
- Using genetic information (DNA level) to predict drug response
- Single nucleotide polymorphism
- Available for wide array of medications
- Involves sample of saliva or blood from the patient


Introduction

• Clinical Utility

• In order for a test to be useful, it must have utility

• Not enough to just have reliable, valid results

• Must have clinical uptake to be considered a useful tool


Pharmacology

- Genomics can help predict
- Helps avoid the “trial and error”
- Increases compliance
- Decreases adverse drug reactions
- Increases satisfaction
Today’s Anesthesia Practice

- Trail and error
- Patient history
- Provider preference
- Community practice
- “One size fits most”
- Rarely exactly the right treatment for pain
The Issue

- Despite good outcomes studies, little is known of the perceived clinical utility by anesthesia providers of the technology
- Some work in the areas of nutrition, cardiology, psychiatry, and pain
- Sparse reports of clinician perception of clinical utility
- Before a test/technology/intervention can be useful, it must have perceived *clinical utility*


Research Question

• What is the perceived clinical utility of pharmacogenomic testing to support anesthesia providers’ prescriptive decision-making to treat acute pain?
Specific Aim

• **Aim 1:** Qualitatively describe anesthesia providers’ perception of factors related to clinical utility of pharmacogenomic testing in supporting prescriptive decision-making
Specific Aim

• **Aim 2:** Develop, generate, and field test a quantitative survey instrument that informs anesthesia providers’ knowledge about pharmacogenomic testing and clinical utility
Framework

- ACCE Model
- Analytic validity
- Clinical validity
- Clinical utility
- ELSI
- This study focuses on clinical utility
Study Design

• Mixed-method sequential qualitative-quantitative design
• Qualitative phase first
• Quantitative phase next based on results of qualitative analysis
Qualitative Phase

• Methodology: multiple-embedded case-study methodology

• Purposive sampling of 10 clinically practicing anesthesia providers

• Semi-structured, focused interviews using interview guide

• Focus on perceived clinical utility of pharmacogenomic testing

Qualitative Design

• Case study methodology based on Yin’s methods
• Each provider represents a case study of their individual practice (many patients)
• Useful for complex phenomena, theory development, intervention planning
Focused Interview Guide

1. What do you perceive as the advantages to this technology?
2. What do you perceive as potential or actual barriers to this technology?
3. How would this technology impact your patients?
4. How would this technology impact your practice?
5. In what ways are/would you anticipate using this technology in your practice?
6. What other information would you like to share about your potential use of this technology?
Data Collection

• Interview conducted at provider’s place of practice
• Private office, conference room, or consultation room
• Audio recorded and professional transcribed
Data Analysis

• Framed by the ACCE model, deductive then inductive analysis was performed
• Validation of transcriptions first by PI
• Deductive coding then inductive coding first by PI then by Expert Methodologist
Data Analysis

• Rigor established through a systematic process of coding and interpretation

• Results of PI and Expert coding was then compared and agreement reached

• Data saturation occurred at n=10 participants


Qualitative Results

- Seven themes emerged
- Deductive:
  - Lack of education/knowledge
    - “Well, I'm not really sure how it would impact the patients because I don't yet know the value of it, I don't know enough about it.”
  - Lack of facilities
    - “I guess coming from a rural-type facility and practice, we're limited a lot of times in things that are available to us. We may not have a big variety of medications to choose from. We tend to be pretty limited to what we have and so, in some ways, it may not influence what we do.”
Qualitative Results

• Deductive continued
  – Economic concerns
    • “Did I really need to do an expensive test to figure that out? Or, can I just write a prescription and if they responded really well to it, okay, break in half-- take a half one, instead. Or, "Wow, that isn't strong enough for you? Okay, well, you have to take two instead of one." I didn't need a multi-thousand dollar test to figure that out”
Qualitative Results

• Deductive continued
  – Perceived effective benefit
    • “I think the advantages to the technology is being able to narrow down with our patients what is the best drug to be used for them - the amounts of the drug. So, that we can target our patient population to tailor the best anesthetic for them
  – Ethical/legal concerns
    • “Oh well, I misinterpreted that information as they are high metabolizers, so, I'm just going to have to keep on giving them more and more medications. I think that might be misleading or a false sense of security.”
Qualitative Results

• Inductive:
  – Complexity of the technology
    • “All of the details of that are very confusing to me. It's not something I am comfortable with and it's almost to the extent that I perceive the interpretation of the test as something that would be so burdensome that I wouldn't want to do it.”
  – Avoiding complications
    • “Less post-operative nausea and vomiting, etc. You know, those kinds of things. Less post-operative pain. I really think that that has a whole lot of promise for patients.”
Item Construction

- From the qualitative findings, a 14-item survey was developed

Item Specifics

• 10-point Likert scale for all items
• Directionality to remain constant
• Degree of agreement with a positive statement
Survey Development

• Cognitive pretesting with 14-item survey conducted with 10 qualitative participants
• Items revised
• Committee consensus obtained
• Survey constructed in REDCap™ survey system
• Survey testing performed among committee members
Sample

• Sample drawn from active, clinically practicing Certified Registered Nurse Anesthetists members of the American Association of Nurse Anesthetists

• Sample of 3000

Data Collection

- Survey deployed electronically to initial sample of 3000
- Reminder email sent 2-weeks into survey period
- Response rate poor; only 143 (4.8%)
- Of those, only 91 (3.0%) complete
A Dilemma

- Plan was to perform Factor Analysis on data
- Varying opinions in the literature about absolute number needed
- Based on various eigenvalues and factor analysis method
- Horn’s parallel analysis n=15 responses per item for a total of 210 responses
Sample Round 2

• Response rate 183 (6.1%)
• Of those, 171 were complete (5.7%)
• A total sample size of 262 complete surveys were returned and used in the data analysis
Data Analysis

• Data analysis using SPSS V. 22 for Mac
• Factor analysis using maximum likelihood extraction method
  – Exploratory & descriptive; assumption of normal distribution relaxed
• Kaiser-Meyer-Olkin used to determine strength of relationship among items as a measure of sampling adequacy


Hutcheson G, Sofroniou N. The multivariate social science scientist: Statistics using generalized linear models. 1999


Data Analysis

• Criteria for extraction
  – Visual inspection of Scree plot
  – Kaiser’s criteria for eigenvalues > 1

• Facilitation of interpretation
  – Direct Oblimin rotation technique
  – Useful when relationships are thought to be related
Data Analysis

- Following maximum likelihood extraction, Horn’s parallel analysis carried out to confirm number of factors retained
Factors

- Factor 1 → “benefit”
- Factor 2 → “knowledge”
- Factor 3 → “concerns”
## Factor Loadings

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor 1 (benefit)</th>
<th>Factor 2 (knowledge)</th>
<th>Factor 3 (concerns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailored care</td>
<td>.879</td>
<td></td>
<td></td>
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<tr>
<td>Quicker wakeup &amp; less pain</td>
<td>.808</td>
<td></td>
<td></td>
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<tr>
<td>Reduce adverse drug events</td>
<td>.741</td>
<td></td>
<td></td>
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<tr>
<td>Perceived benefit</td>
<td>.467</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort with testing</td>
<td></td>
<td>.803</td>
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<tr>
<td>Enough knowledge to use</td>
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<td></td>
<td>.753</td>
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<tr>
<td>Specific training on testing</td>
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<td></td>
<td>.576</td>
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<tr>
<td>Way to order</td>
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<td>.498</td>
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<tr>
<td>Easy to use</td>
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<td></td>
<td>.462</td>
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<tr>
<td>Location uses testing</td>
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<td>.439</td>
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<tr>
<td>Cost prohibitive</td>
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<td>.932</td>
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<td>Cost is reason not used</td>
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<td>.629</td>
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<tr>
<td>Testing means more liability</td>
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<tr>
<td>Ethical concerns about testing</td>
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</tbody>
</table>
Conclusions

• Anesthesia providers perceive a potential benefit to pharmacogenomic testing
• Anesthesia providers lack knowledge about pharmacogenomic testing
• Anesthesia providers have concerns about the ethical and economic aspects of pharmacogenomic testing
Limitations

- Low response rate
- Only surveyed CRNA providers
- Interviews only conducted in North Texas
Future Directions

• Further analysis of existing quantitative data
  – Correlation between variables
  – Additional samples

• Further refinement of survey instrument

• Ultimately plan for an intervention aimed at increasing knowledge and decreasing concerns