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 **CHOC Children's.**

Alternate Site Testing for Hemoglobin A1c in Children with Diabetes

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Background

- Literature supports use of alternate site testing (AST) for blood glucose (BG) levels in euglycemic state ⁽¹⁻⁸⁾
- No published studies on use of AST for collection of Hemoglobin A1c (HbA_{1c})
- Current policy/practice at CHOC diabetes clinic is to collect sample for HbA_{1c} at fingertip

Purpose

- To evaluate whether use of the palm or forearm is as reliable and accurate as the fingertip as a collection site to measure HbA_{1c}
- Study of equivalence
- Also evaluate pain perception and site preference
- Support family centered care principles in practice through listening to and honoring the patient/family perspective and choices related to HbA1c collection

Methods

- IRB approval
- Convenience sample from CHOC clinics at Orange and Costa Mesa
- Randomization of alternate site, sample order, machine for processing prior to study
- Instrument linearity and calibration verified prior to study start
- Demographic data: age, gender, race/ethnicity, length of diagnosis, DM type, home test site
- FACES scale for pain rating
- Stated preference at end

Wong-Baker FACES Pain Rating Scale



Explain to the person that each face is for a person who feels happy because he has no pain (hurt) or sad because he has some or a lot of pain. **Face 0** is very happy because he doesn't hurt at all. **Face 1** hurts just a little bit. **Face 2** hurts a little more. **Face 3** hurts even more. **Face 4** hurts a whole lot. **Face 5** hurts as much as you can imagine, although you don't have to be crying to feel this bad. Ask the person to choose the face that best describes how he is feeling.

Ascensia Microlet Alternate Site Lancet Device



Results

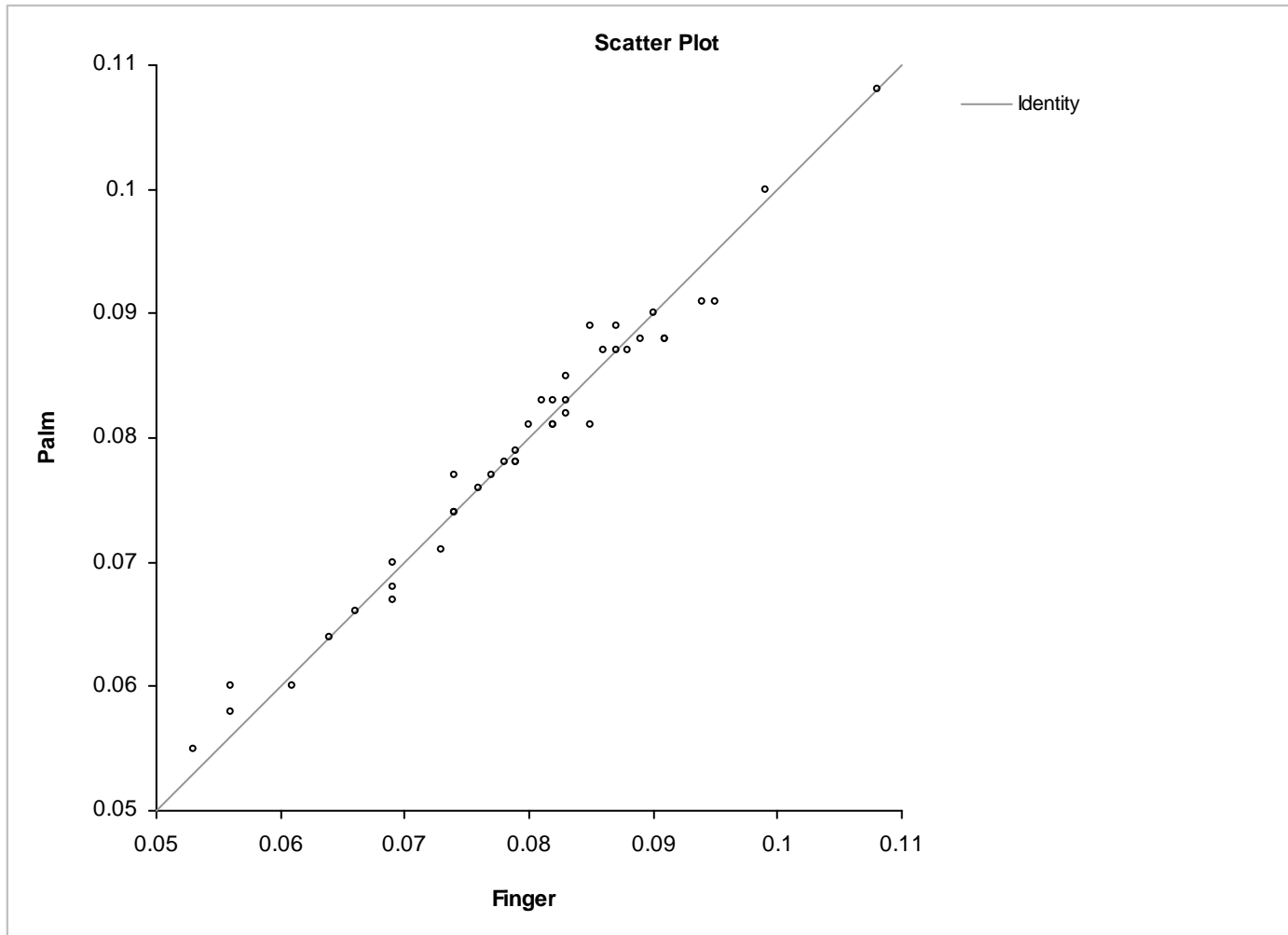
- 84 participants total, 81 for HbA_{1c} results analysis
- 3 forearm results lost to insufficient sample
- Sample population well distributed and reflective of clinic population with regard to gender, ethnicity, age, and length of diagnosis.
- Although alternate site testing for BG levels at home has gained in popularity in recent years, only 8.3% of participants in this study stated they used an alternate site at home, and all reported using their forearm

Characteristic	n	% sample
Age (years)		
Mean (SD)	12.96 (4.14)	
Range	5-20	
Gender		
Male	50	59.5
Female	34	40.5
Race		
Caucasian	44	52.4
Hispanic	27	32.1
Asian	4	4.8
African-American	2	2.4
Other	7	8.1
Diabetes Type		
Type 1	68	81
Type 2	16	19
Length of Diagnosis (months)		
Mean (SD)	51.01 (44.37)	
Range	2-216	
Home Testing Site		
Fingertip	77	91.7
Palm	0	0
Forearm	7	8.3

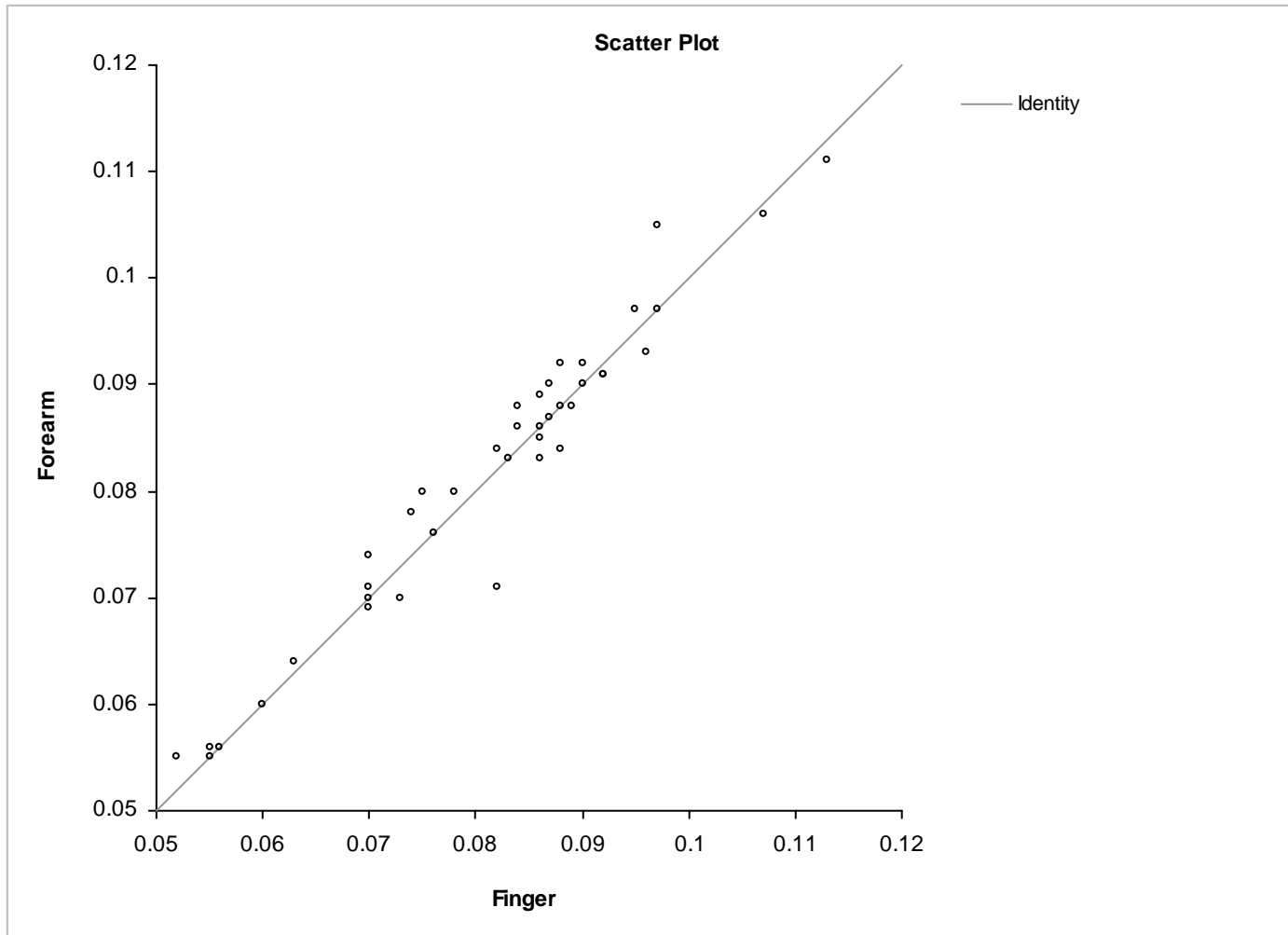
Results

- HbA_{1c} results from the alternate sites had a high degree of agreement with HbA_{1c} results from the fingertip
- Intraclass correlation coefficients were: 0.99 for the fingertip and palm; 0.98 for the fingertip and forearm.
- Paired t-tests showed no difference between either set of values
- Bland-Altman bias was minimal: -0.01% (95% CI, -0.07-0.05%) for the fingertip/palm comparison and 0.0% (95% CI -0.001 to 0.001) for the fingertip/forearm comparison

Bland-Altman Scatter Plot for Agreement Between Fingertip and Palm HbA1c Results



Bland-Altman Scatter Plot for Agreement Between Fingertip and Forearm HbA1c Results



Results- pain perception

- Mean rating for pain at the fingertip was 0.65 (standard deviation [SD]=.95);
- Mean pain rating at palm was 1.24 (standard deviation [SD]=.1.113);
- Mean pain rating at forearm was 0.60 (standard deviation [SD]=.98).
- 49 (58.3%) rated the pain at “0” at the fingertip
- AST pain ratings were lowest for the forearm (rating=0 for 62.8% of forearm-fingertip sample), followed by the palm (rating=0 for 29.3% of palm-fingertip sample).

Results- Site Preference

- Overall, the fingertip was preferred by 54.8%, the forearm by 25%, the forearm by 25%, and the palm by 20.2% of the participants.
- Alternate sites received favorable reviews (rating 0-2) with regard to pain by 92% of the study participants, despite the fact that this was the first exposure to alternate site testing for the majority of participants

Limitations/Implications

- Few participants in the study used alternate site testing for BG testing at home
- Consideration should be given to assignment of the fingertip site used for the study rather than allowing the participant to choose, to decrease bias
- Future alternate site studies should use updated lancing devices with promise of increased ease of use and collection of blood samples and less pain sensation
- Findings of study are limited to the pediatric setting; further study in the adult population is warranted

Conclusions

- Findings affirmed that blood samples for measurement of HbA1c are clinically equivalent from the fingertip and palm or forearm.
- When obtaining blood samples for HbA1c in the ambulatory care setting as a point of care test, preferences of the child can be honored and family centered care supported without affecting laboratory values
- Practice in the CHOC Children's diabetes clinic have been updated to incorporate results

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Thank you.