# Reliability of Electronic Versus Manual Wound Measurement Techniques Amongst Healthcare Professionals

Jacob Carmichael, DPM, Mohammad Hassan, DPM, Lawrence A. DiDomenico, DPM, FACFAS, FACFAOM, CWS
East Liverpool City Hospital

## Purpose of Study

Wound care in a hospital setting involves patient assessment by multiple healthcare professionals, all of which assess and document wound measurements individually. As there is no universal standard for measuring wounds, measurements are subject to human error as well as subjective differences in techniques. Our goal is to assess the variance between these measurements and compare them to a non-biased digital wound measurement system, both to show the variance among human measurement and assess the reliability of digital measurement.

## Hypothesis

We predicted the measurements taken by the attending would closely match the digital measuring program with lower root-mean-square error (RMSE).
We predicted the resident physicians measurement would show the largest discrepancy and the greatest RMSE.

## Results

Intraobserver variation not significant in most measurement techniques.
Interobserver variation significant for all techniques.
Measurements performed by each individual were very close to each other, and showed the highest RMSE to the actual measurement, whereas the measurements obtained by the electronic device showed lowest RMSE and more accurate.
Measurements taken by attending most closely correlated to measurements taken by digital program.

## Literature Review/Discussion

Currently, there is no standardization for the measurement of wounds.
Multiple modalities exist, including ruler measurements, mathematical models, acetate tracings/contact planimetry, digital planimetry and structured light devices. Literature reviews show that digital planimetry and digital imaging consistently demonstrates precision and reliability, particularly in larger and irregular shaped wounds (1,4).
Studies concerning the use of 3D measurement devices and laser guided devises have shown some promise, with high accuracy and reproducibility (2,3).
However, the cost and availability of these devices limits their practical application (1) and some of these devices require complex setup and are prone to user error in the untrained (4).
Ultimately, our study reinforces the strength of digital wound measurement. Not only has it been shown to be reliable and accurate, many digital measurement programs are free and easy to use.
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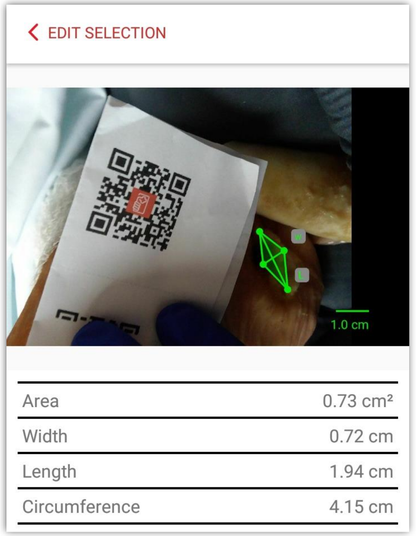
## Methods

10 wounds measured by attending physician (L.D.), resident physician (J.C.), wound care nurse, and non-biased digital measuring program. All the subjects blinded for each measurement. Mixed linear models fitted to determine interobserver and intraobserver variability. The average root mean square error (RMSE) for each measurement technique determined to investigate the accuracy.




| | Attending | Nurse | Resident | Electronic | RMSE |
|---|---|---|---|---|---|
| Patient 1 | 3 x 4 x 1 cm | 2.2 x 3 x 0.6 cm | 2.1 x 3 x 0.6 cm | 3 x 3.9 x 0.9 cm | 95.00% |
| Patient 2 | 4 x 4 x 1 cm | 2.2 x 3 x 0.6 cm | 2.1 x 3 x 0.6 cm | 4 x 4.5 x 0.9 cm | 97.00% |
| Patient 3 | 5 x 4 x 1 cm | 7 x 4 x 1 cm | 8 x 4 x 1 cm | 5 x 3 x 0.9 cm | 96.30% |
| Patient 4 | 6 x 3 x 1 cm | 5.1 x 3 x 0.6cm | 2.1 x 3 x 0.6 cm | 6 x 3 x 0.9 cm | 97.40% |
| Patient 5 | 7 x 5 x 1 cm | 9 x 5 x 1 cm | 7.9 x 5 x 1 cm | 7 x 4.5 x 0.8 cm | 98.00% |
| Patient 6 | 8 x 4 x 1 cm | 8 x 3 x 0.6cm | 10.5 x 4 x 1 cm | 8 x 3.9 x 0.9 cm | 99.00% |
| Patient 7 | 9 x 4 x 1 cm | 2.2 x 3 x 0.6cm | 8 x 4 x 1 cm | 9 x 3 x 0.9 cm | 97.00% |
| Patient 8 | 3 x 4 x 1 cm | 2.2 x 3 x 0.6cm | 3.5 x 4 x 1 cm | 2.7 x 3 x 0.9 cm | 94.60% |
| Patient 9 | 5 x 4 x 1 cm | 2.2 x 3 x 0.6 cm | 2.1 x 3 x 0.6 cm | 5 x 3 x 0.9 cm | 94.90% |
| Patient 10 | 5 x 4 x 1 cm | 2.2 x 3 x 0.6 cm | 2.1 x 3 x 0.6 cm | 4 x 3.5 x 0.9 cm | 97.00% |

## Conclusions

Digital wound measuring had the strongest correlation to measurements taken by the attending and can be considered a reliable and accurate tool in woundcare. Significant interobserver variation amongst other healthcare professionals further strengthens the value of using a standardized digital measuring system, as does the ease of use and cost efficiency.

## References

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