

Comparative Dose Accuracy of Durable and Patch Insulin Infusion Pumps

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Abstract

Background:

As all major insulin pump manufacturers comply with the international infusion pump standard EN 60601-2-24:1998, there may be a general assumption that all pumps are equal in insulin-delivery accuracy. This research investigates single-dose and averaged-dose accuracy of incremental basal deliveries for one patch model and three durable models of insulin pumps.

Method:

For each pump model, discrete single doses delivered during 0.5 U/h basal rate infusion over a 20 h period were measured using a time-stamped microgravimetric system. Dose accuracy was analyzed by comparing single doses and time-averaged doses to specific accuracy thresholds ($\pm 5\%$ to $\pm 30\%$).

Results:

The percentage of single doses delivered outside accuracy thresholds of $\pm 5\%$, $\pm 10\%$, and $\pm 20\%$ were as follows: Animas OneTouch® Ping® (43.2%, 14.3%, and 1.8%, respectively), Roche Accu-Chek® Combo (50.6%, 24.4%, and 5.5%), Medtronic Paradigm® Revel™/Veo™ (54.2%, 26.7%, and 6.6%), and Insulet OmniPod® (79.1%, 60.5%, and 34.9%). For 30 min, 1 h, and 2 h averaging windows, the percentage of doses delivered outside a $\pm 15\%$ accuracy were as follows: OneTouch Ping (1.0%, 0.4%, and 0%, respectively), Accu-Chek Combo (4.2%, 3.5%, and 3.1%), Paradigm Revel/Veo (3.9%, 3.1%, and 2.2%), and OmniPod (33.9%, 19.9%, and 10.3%).

Conclusions:

This technical evaluation demonstrates significant differences in single-dose and averaged-dose accuracy among the insulin pumps tested. Differences in dose accuracy were most evident between the patch pump model and the group of durable pump models. Of the pumps studied, the Animas OneTouch Ping demonstrated the best single-dose and averaged-dose accuracy. Further research on the clinical relevance of these findings is warranted.

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Abbreviations: (PEEK) polyetheretherketone

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