

BACKGROUND AND AIMS

Insulin pumps require an alarm feature to notify the user about occlusions in the tubing or the catheter tip to ensure adequate insulin supply. There is no explicit demand regarding a maximal delay time between occlusion and alarm. In this study, occlusion detection time of two new tubeless pumps was evaluated and compared to previous data from an already established patch pump.¹

METHOD

Cannulas of the Accu-Chek® Solo micropump [ACS] and the A6 TouchCare® pump [A6] (figure 1, table 1) were occluded with a clamp or rubber cap (figure 2) and time until an occlusion alarm occurred was stopped using two different basal rates (1 U/h and 0.1 U/h). Each experiment was repeated 9 times.

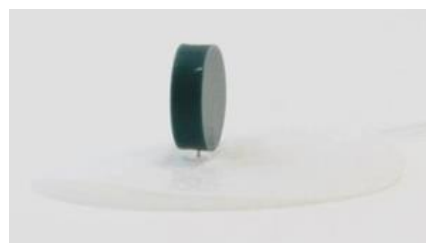


Figure 2: Induction of occlusion in steel needles (left) and soft cannula (right).

Table 1: Tested insulin pump systems (in bold).
*Previously tested.¹

Insulin pump	Cannula	Reservoir
ACS	6.0 mm, Teflon	2 ml
A6	5.0 mm, Steel	2 ml
OP*	6.5 mm, Teflon	2 ml



Figure 1: Tested insulin pump systems: ACS (left) and A6 (right, www.diashop.de).

RESULTS

At the 1 U/h basal rate, the mean occlusion detection time was 02:57 [hh:mm] for ACS and 07:26 for A6. Using the smaller basal rate of 0.1 U/h, an alarm occurred after 35:11 for ACS. For A6, no occlusion alarm occurred in any of the 9 repetitions until the end of the pump run time (table 2, figure 3).

CONCLUSION

Occlusion detection was faster with ACS than with A6 and the previously tested OmniPod® [OP] at the higher basal rate, supporting a timely response to the alarm. At the lower rate, occlusion detection was markedly delayed with both ACS and OP, and failed with A6.

Table 2: Measured occlusion detection time [hh:mm] at both tested basal rates and occlusion detection times specified in the respective manual, if applicable.
*Results from previous tests.¹

Insulin pump	1 U/h					0.1 U/h				
	Mean	Median	Min	Max	Manual	Mean	Median	Min	Max	Manual
ACS	02:57	02:54	02:30	03:33	max 5 h	35:11	36:03	23:05	50:49	max 50 h
A6	07:26	07:05	06:23	10:56	< 3 h	9x no alarm				< 30 h
OP*	03:38	03:55	02:26	04:48	max 5.5 h	34:30	35:39	26:43	43:09	n.a.

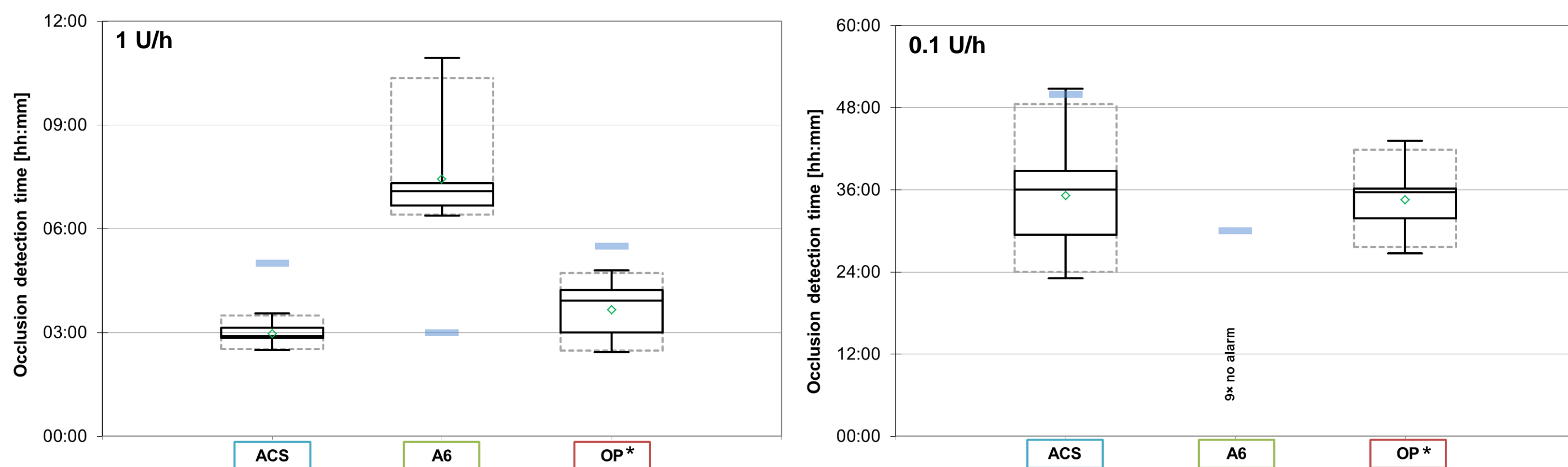


Figure 3: Occlusion detection time at basal rate of 1 U/h (left) and 0.1 U/h (right), 9 measurements, ACS (left), A6 (middle), OP (right). Green diamonds show means, black boxes represent 50% of values including median, grey boxes represent 95% of values and antennae show minimum and maximum. Blue bars show maximum time as indicated in the respective user manual, if applicable. *Results from previous tests.¹