Feasibility of an Electronic Stethoscope System for Monitoring Neonatal Bowel Sounds

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Bowel dysfunction remains a major problem in neonates. Traditional auscultation of bowel sounds is a non-invasive diagnostic aid in gastrointestinal complications such as necrotizing enterocolitis, intestinal obstruction and gastrointestinal malrotation, but has its limitations. We built an investigational device to study the feasibility of an electronic bowel monitoring system. Continuous bowel sound recordings were made. Signal quality within the hospital environment and the ability to maintain fixation of the stethoscope head was also evaluated. The device was appropriately designed for use in infants, consisting of a prototype stethoscope head with a built-in microphone attached to a Tascam recorder with a flash drive. The stethoscope head was held over the abdomen by a specifically designed hydrogel patch. It was tested on eight healthy, full term babies. A scoring system was used to determine loudness, clarity and ease of recognition comparing it to the traditional stethoscope. The duration of attachment was increased during the course of the study to a maximum of 8 hours. Median duration of attachment was 3 hours (3.75, 2.68). Based on the scoring, the bowel sound recording was perceived to be as loud and clear in sound reproduction as a traditional stethoscope. In addition, we could provide a visual display of the bowel sounds. We determined room noise and conducted noises were interfering in the recordings. No sound quality drift or patient discomfort was noted. Minimal erythema was observed over the fixation site which subsided in one hour. Based on our results, we conclude that the device has a potential to improve monitoring of neonatal bowel sounds. Our larger goals will target incorporation of acoustic filters to improve the quality of sound recordings and to automatically close the loop by connecting the device to feeding pumps.

Figure 1: Second Generation Adhesive patch used to hold the electronic stethoscope

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