

Remote operation for non-fluoroscopic navigation of complex tachycardias

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Introduction: Non-fluoroscopy navigation systems have evolved and it has had a positive impact on the electrophysiological procedures. Non-medical staff as field clinical specialists (FCS) have been essential in obtain these results, nevertheless, they need to provide their duties on-site. In some situations as a Pandemic sceneries, remote operation of the navigation system could avoid unnecessary exposure of this staff to a high-risk hospital environment.

Purpose: Remote system operation technology was developed and applied to a non-fluoroscopic navigation system in order to overcome Spanish mobility restrictions caused by Covid-19 pandemic infection and subsequently used routinely.

Methods: Fifty consecutive complex ablations were performed in different days using this technology. All these procedures were assisted remotely with the only intervention of a field clinical specialist located at his home who took full control of the navigation system (keyboard, mouse and screen) and had bidirectional real time audio/video feedback with the operating physician. Once the connection was established, the remote field clinical specialist replicated the Rhythmia screen at the remote location with all its features, and interacted identically with the physician, essentially with no perceptible differences from being physically present.

Results: There were neither interruptions nor perceptible delays in the bidirectional communications between the remote field clinical specialist and the operating physician during the procedures. Video signal delay ranged from 265 to 325 milliseconds. All the procedures were uneventful.

Conclusions: Remote System Operation allowed full teleoperation of a non-fluoroscopic navigation system (keyboard, mouse and screen) as well as bidirectional real time audio/video feedback with the operating physician, providing a fully autonomous remote assistance in 50 complex ablation procedures. This technology ensures workflow continuity and optimal workforce flexibility and has relevant and promising implications in the field of training, teaching and resource optimization that deserves further development.

Latency measurements.

Hospital Location	Pamplona	Pamplona	Pamplona
Remote operator location	Bilbao	Madrid	Tarragona
T ₁ (s/ms)	58s 120ms	28s 340ms	33s 380ms
T ₂ (s/ms)	58s 680ms	28s 960ms	33s 940ms
T ₂ -T ₁ (ms)	560 ± 32	620 ± 33	560 ± 30
Latency = (T ₂ -T ₁)/2 (ms)	280 ± 15	310 ± 15	280 ± 10

Measurements of the video delay ranged from 265 to 325 milliseconds.

Abstract Figure. Local and Wide area network architecture

