Electromagnetic Interference With Infusion Pumps From GSM Mobile Phones: Effect of Distance And Emitted Power

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Electromagnetic interference with critical medical care devices has been reported by various groups. Previous studies have demonstrated that volumetric and syringe pumps are susceptible to false alarm buzzing and blocking, when exposed to various electromagnetic sources. The risk of electromagnetic interference depends on several factors such as the phone-emitted power, distance and carrier frequency. Aim of this study was to assess the risk of GSM phone-induced electromagnetic interference with volumetric and syringe pumps, at various distances and emitted powers. The pumps were connected to a pump tester/patient simulator (Metron QA-IDS, Norway) placed on the same table, 1 m apart. Volumetric pumps and syringe pumps were set at 250 ml/h and 50 ml/h infusion rates, respectively. Eight volumetric and four syringe pumps from the following manufacturers were tested: Alaris, Abbot, Nutricia, B|Braun. Three mobile phones were used: Motorola V3688, Ericsson SH888 and Nokia 3510. These models were chosen for they cover different types of antenna: unfold phone with fixed dip aerial, fixed dip aerial, and built-in aerial in back plate of mobile phone. Malfunctions were observed in 6 out of 8 volumetric pumps and in 1 out of 4 syringe pumps, exposed to mobiles at their maximum output, for distances up to 30 cm. When any malfunction occurred, the pumps always stopped and alarms set off. The specific error messages differed among the pumps, mostly indicating problems with the infusion set or the electronics. No spontaneous restarting was observed. After resetting, all the devices worked regurarly without permanent effects. Although we found that a limitation of the mobiles to peak power levels as low as 0.05 W for 900 MHz and 0.0025 W for 1800 MHz is required for the total immunity of the pumps tested, values lower than 0.08 W would reduce the risk from 60% to 20%. Since if an adequate base station signal is present GSM phones are designed to operate at low-power classes to battery saving, in state-of-the-art pumps, the presence of moderate-good base station coverage would reduce the risk of electromagnetic interference down to less than 20%.