

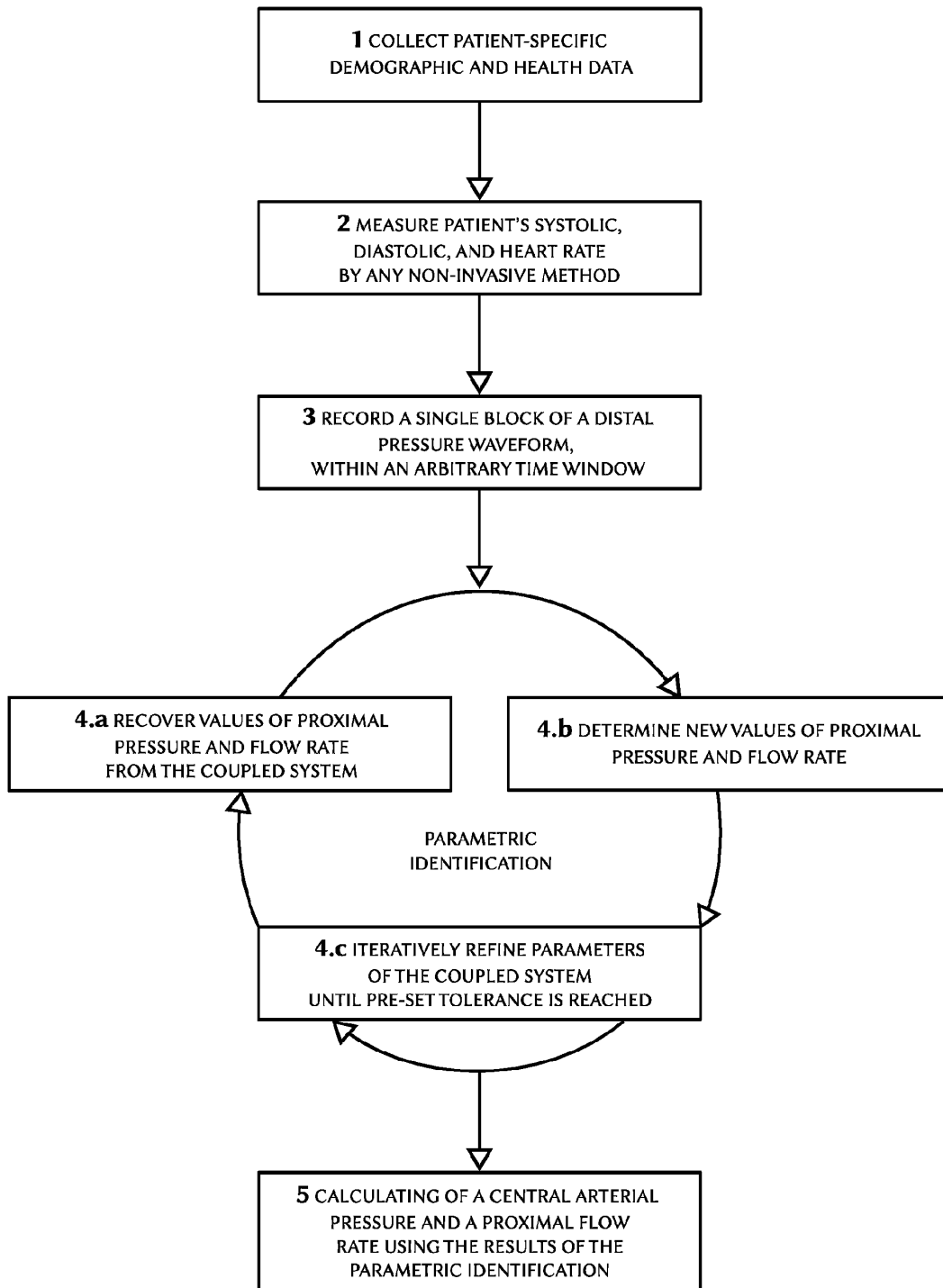
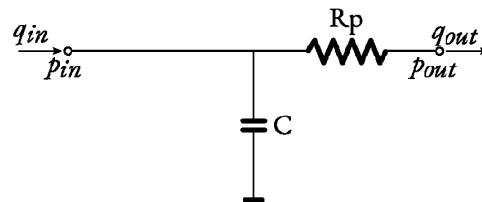


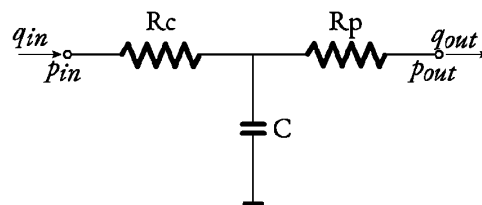
FIG. 1

2WM: two-element Windkessel model
of Otto Frank



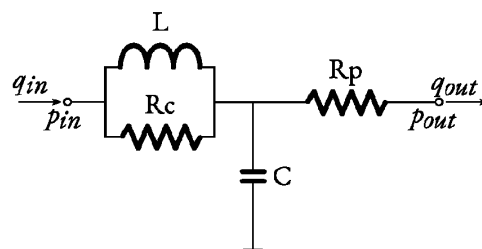
Frank O. Die Grundform des Arteriellen Pulses .
Zeitschrift für Biologie. 1899;37: 483-526

3WM: three-element Windkessel model
of Nicolaas Westerhof



Westerhof N et al. Analog studies of the human systemic arterial tree.
J Biomech. 1969; 2(2):121-143

4WM: four-element Windkessel model
of Nikos Stergiopoulos

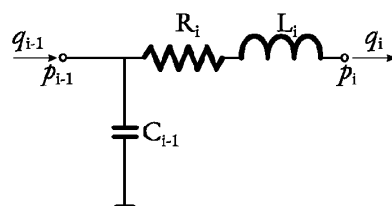


Stergiopoulos N et al. Total arterial inertance as the fourth element of the windkessel model.
Am J Physiol. 1999; 276(1):H81-88

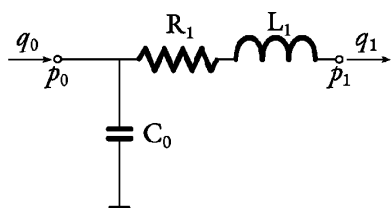
p_{in} , q_{in} – pressure and flow rate at the inlet of compartment
 p_{out} , q_{out} – pressure and flow rate at the outlet of compartment
 R_c , R_p , C , L – proximal and distal resistance, compliance and inertance

FIG.2

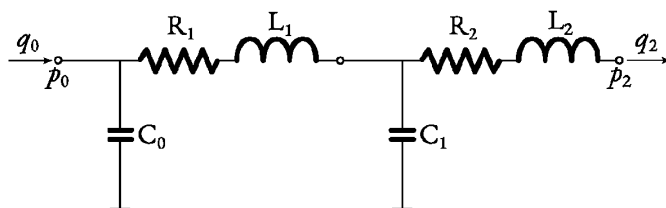
CRL: building-block of lumped-parameter model



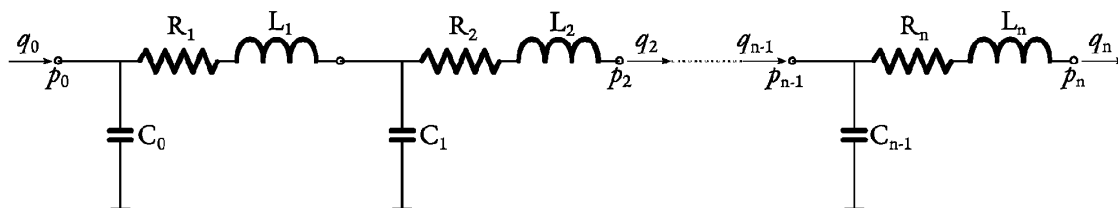
1-CRL: 1-compartment CRL lumped-parameter model



2-CRL: 2-compartment CRL lumped-parameter model



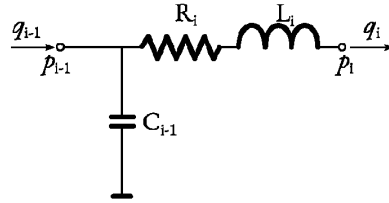
n-CRL: n-compartment CRL lumped-parameter model



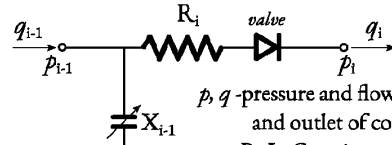
p, q - pressure and flow rate at inlet and outlet of compartments
 R, L, C - resistance, inductance, and compliance

FIG.3

(a) vascular compartment functional block

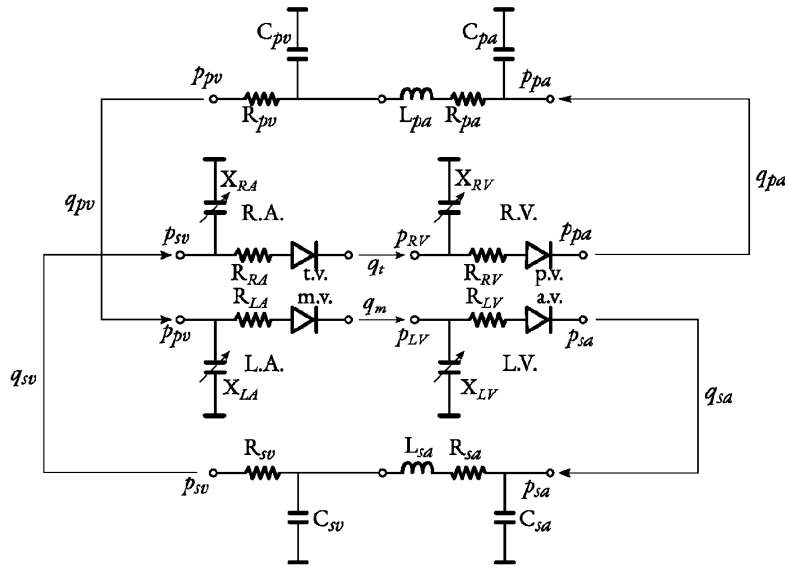


(b) heart chamber functional block

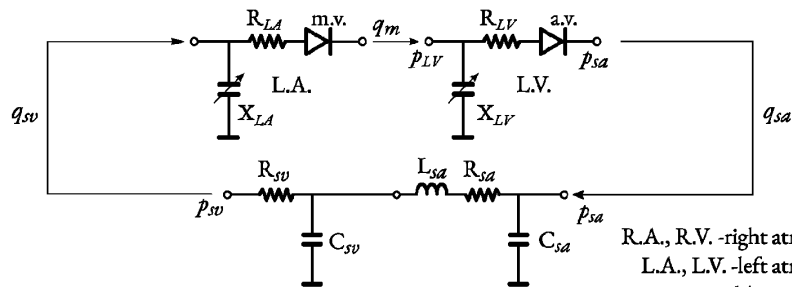


p, q - pressure and flow rate at inlet and outlet of compartments
 R, L, C - resistance, inductance, and compliance
 X - time-varying elastance (E) or myocardial fiber stress and strain (MF) of heart chamber

(c) double closed-loop central compartment circuit

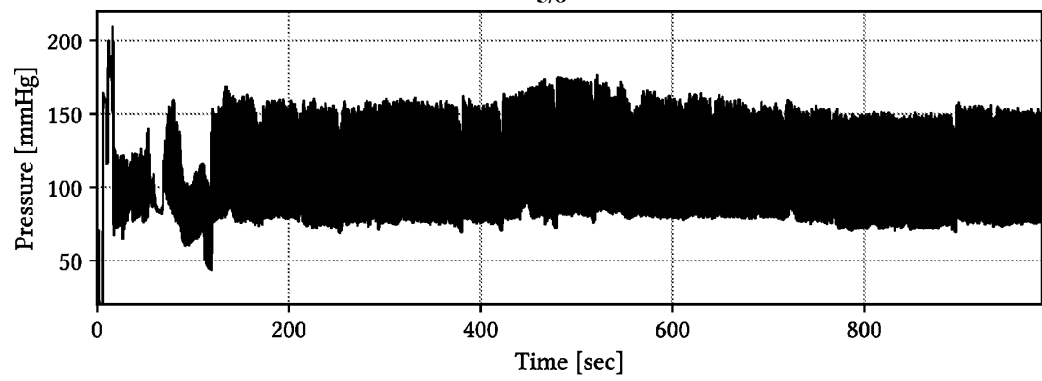


(d) single closed-loop central compartment circuit

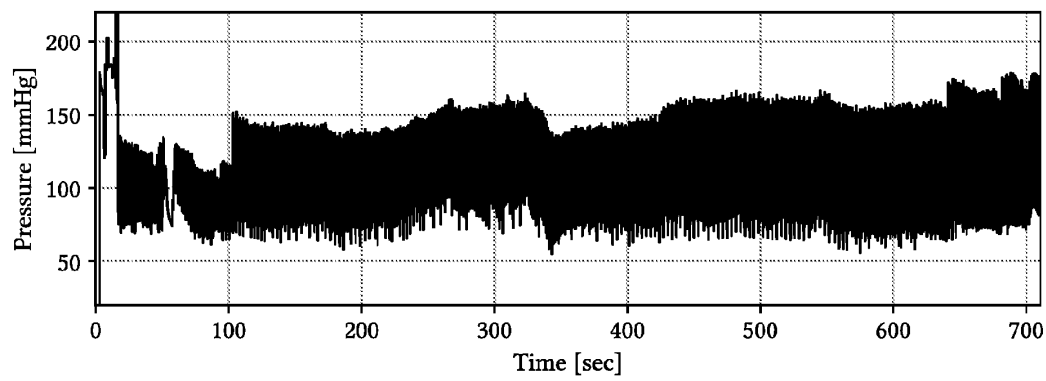
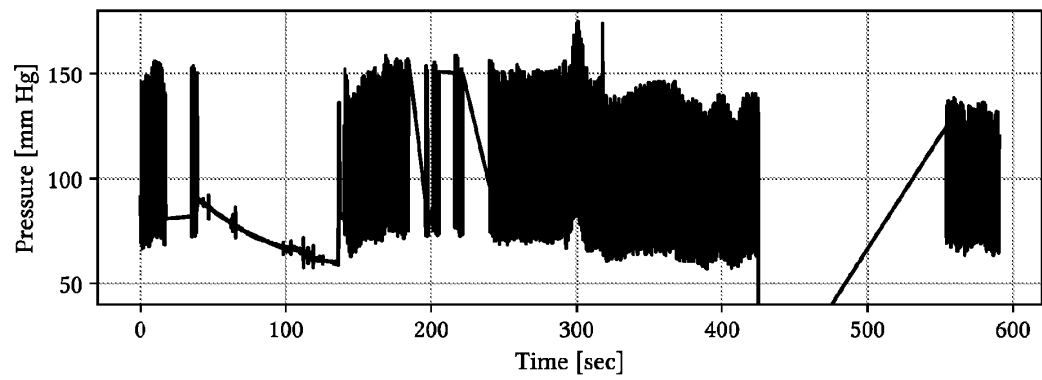


R.A., R.V. - right atrium and ventricle
 L.A., L.V. - left atrium and ventricle
 t.v. - tricuspid (atrio-ventricular) valve
 p.v. - pulmonary (ventricular) valve
 m.v. - mitral (atrio-ventricular) valve
 a.v. - aortic (ventricular) valve
 pa - arteries (pulmonary circulation)
 pv - veins (pulmonary circulation)
 sa - aorta (systemic circulation)
 sv - veins (systemic circulation)

FIG.4



CASE A



CASE B

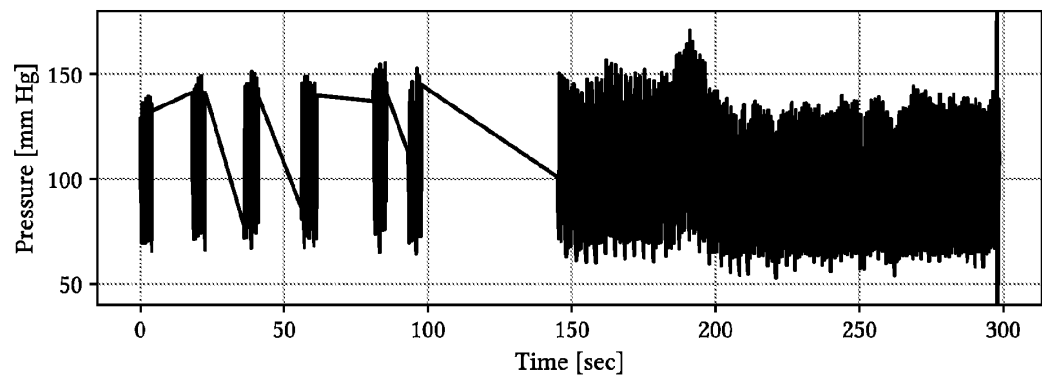


FIG.5

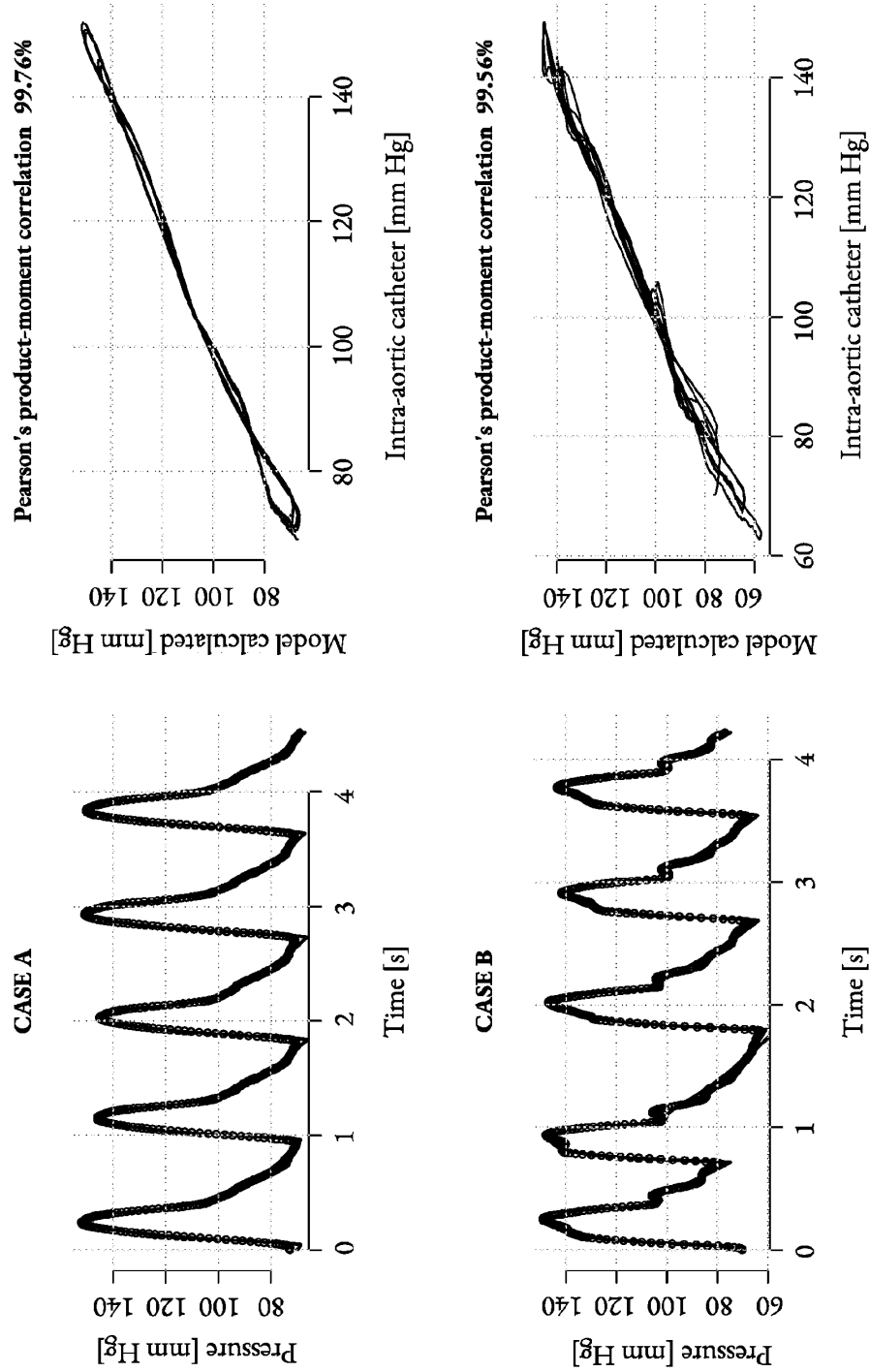
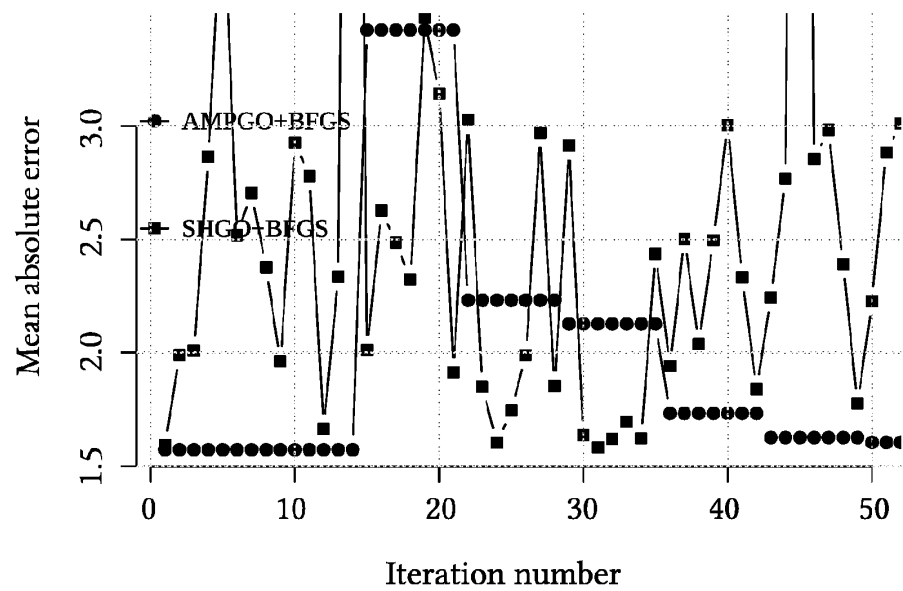


FIG.6

Convergence of Global Method of Central Pressure Reconstruction



Convergence of Local Method of Central Pressure Reconstruction

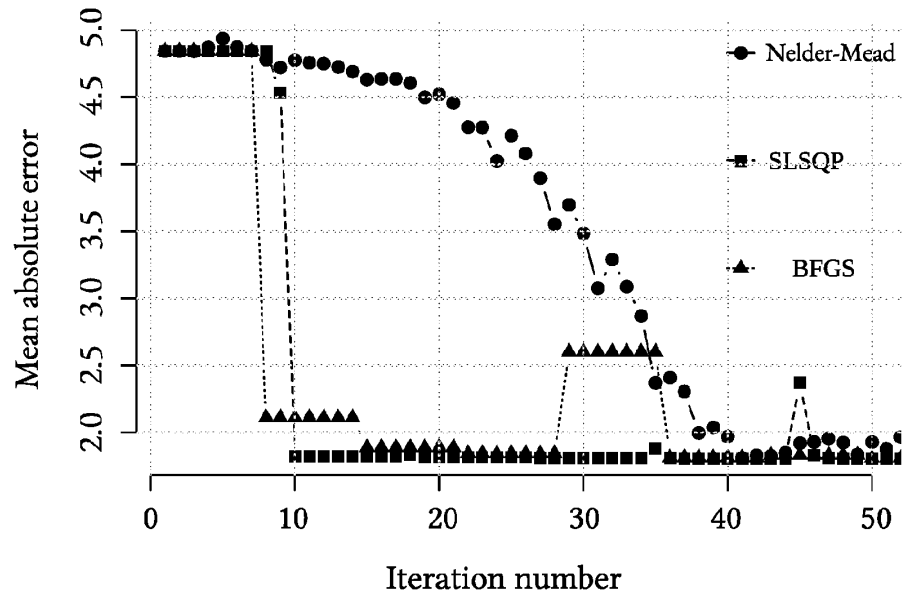


FIG.7

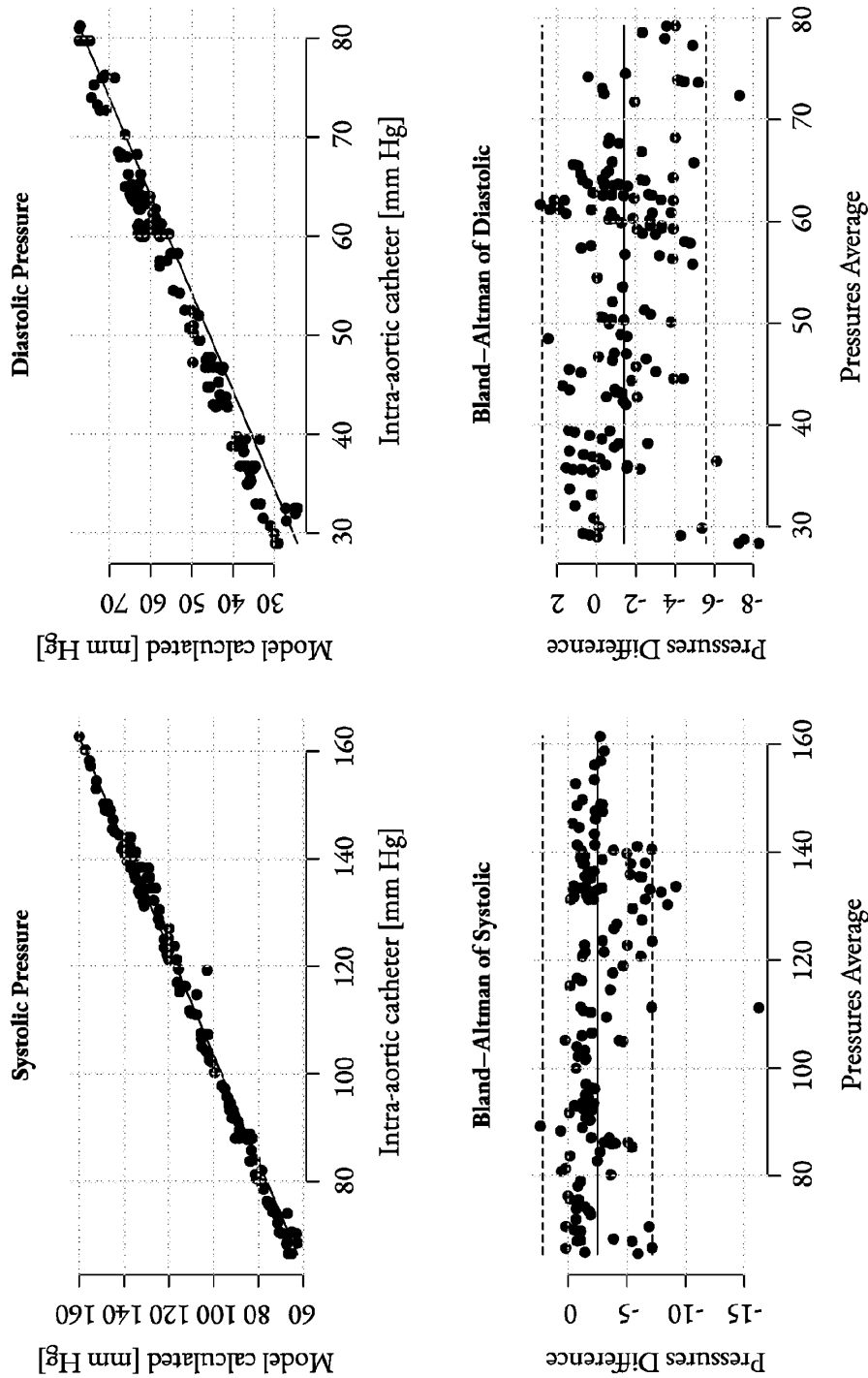


FIG.8