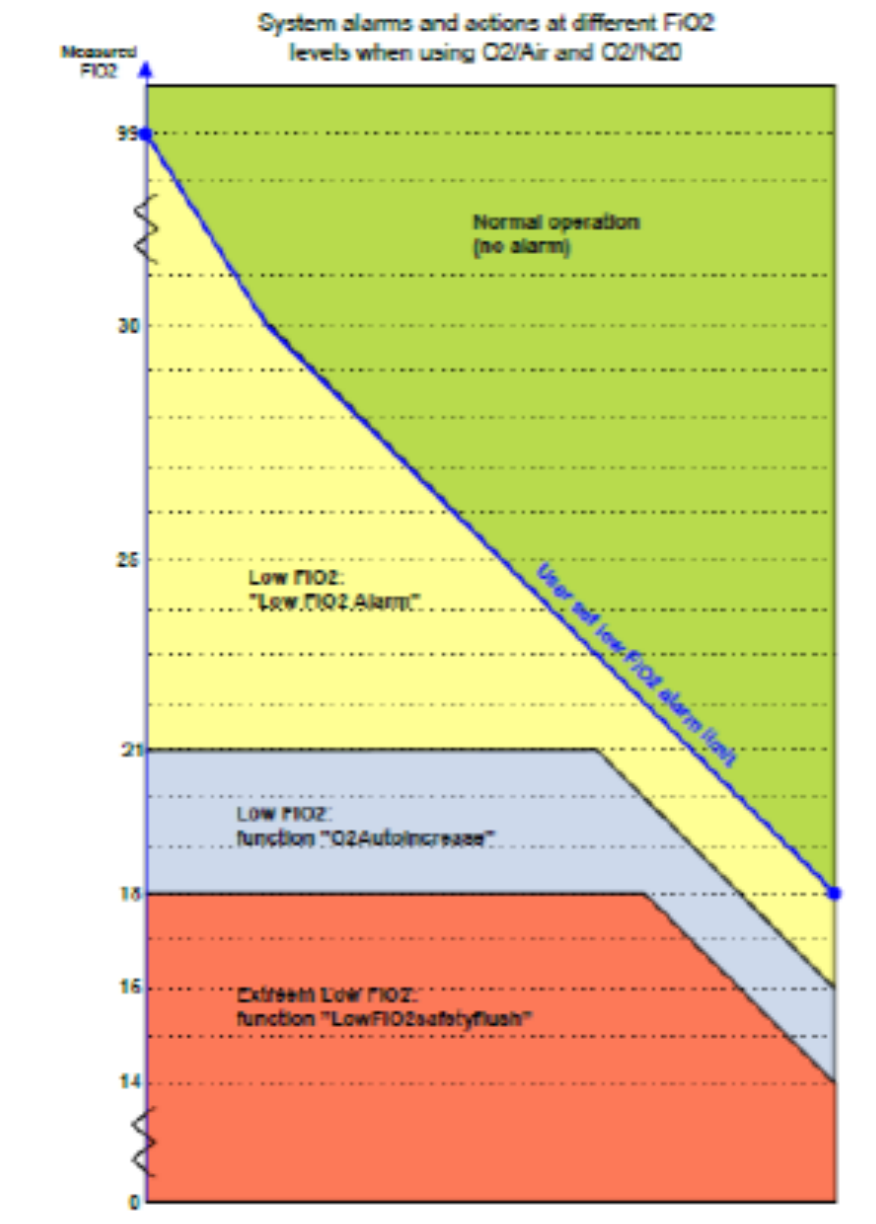


Performance of the Inspired Hypoxic O₂Guard[®]

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Background

Hypoxic guards systems fail to prevent the formation of $F_{iO_2} < 21\%$ when a second carrier gas is used with O_2 (N_2O or air) [1]. The risk is most pronounced with fresh gas flows (FGF) = 1 - 2 L/min

The FLOW-i is equipped with an active inspired hypoxic guard (O₂Guard[®]): software overrides the anesthesiologist's settings if $F_{iO_2} < 21\%$

We examined the performance of the (O₂Guard[®]) over a wide FGF range of O_2 /air mixtures used with the lowest possible delivered O_2 % the machine allowed (= at the delivered hypoxic guard limits)

Methods

•IRB approval, informed consent

ASA I -II, abdominal or breast surgery, n= 12

IV induction, controlled mechanical ventilation to maintain normocapnia

Maintenance with sevoflurane in O_2 /air

FLOW-i[®] (Maquet, Solna, Sweden)

•First 10 min after intubation of the trachea: 20 L/min O_2 /air FGF with $F_{iO_2} = 30\%$

Subsequent O_2 /air FGF and F_{iO_2} management:

4 min episodes of 20 L/min FGF with $F_{iO_2} = 30\%$ alternated with at least 4 min of the following FGF/ F_{iO_2} combination, expressed as [total FGF in L/min; F_{iO_2} in %] (Figure 1):

[0.3;67], [0.4;50], [0.6;34], [0.8;25], [1.0;21], [1.2;21], [1.5;21], [2;21], [3;21], and [5;21]

•Parameters collected:

F_{iO_2} course

Time until 20% F_{iO_2}

Time until the O_2 Guard was activated after $F_{iO_2} = 20\%$

Time for F_{iO_2} to decrease from 30 to 21% *if it happened*

Fresh gas flow (FGF) and F_{iO_2} used by the O_2 Guard

Time until return of $F_{iO_2} = 25\%$ after the O_2 Guard was activated

Time from : time (sec) from $F_{iO_2} = 20\%$ until return to $F_{iO_2} = 25\%$

Results

Figures at the bottom of the poster: F_{iO_2} course in the individual patients

Figure 2: incidence of $F_{iO_2} < 21\%$: Figure 2

Figure 3: time until the O_2 Guard was activated after $F_{iO_2} = 20\%$

Figure 4: Time for F_{iO_2} to decrease from 30 to 21% *if it happened* (see figure 2)

Fresh gas flow (FGF) and F_{iO_2} used by the O_2 Guard

•with FGF < 1L/min: FGF increased to 1.0 L/min with F_{iO_2} to 60%

•with FGF > 1L min: same FGF, F_{iO_2} increased to 1.0 l/min - 60%

Figure 5: time (sec) from O_2 Guard activation until $F_{iO_2} = 25\%$

Figure 6: time (sec) from $F_{iO_2} = 20\%$ until return to $F_{iO_2} = 25\%$

Conclusion

•In low flow anesthesia [1.0;21] - [2;21] combinations of FGF- F_{iO_2} highest chance of creating hypoxic mixture

•The active inspired hypoxic guard (O₂Guard[®], FLOW-i[®] [Maquet, Solna, Sweden]) automatically increases F_{iO_2} in case an hypoxic mixture is measured

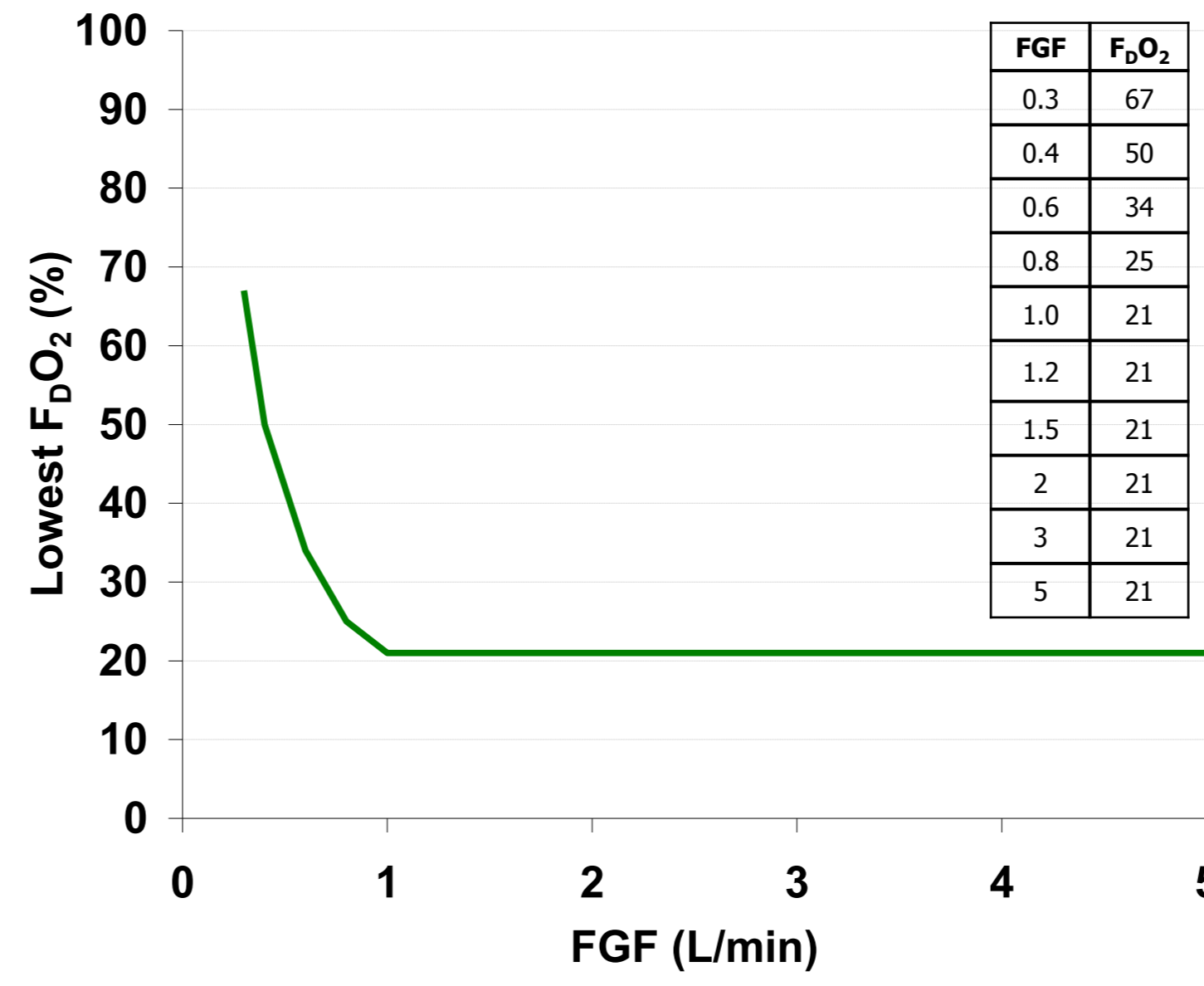


Figure 1. FLOW-i hypoxic guard limits for O_2 /air (= lowest O_2 % that machine allows to be delivered, F_{iO_2})

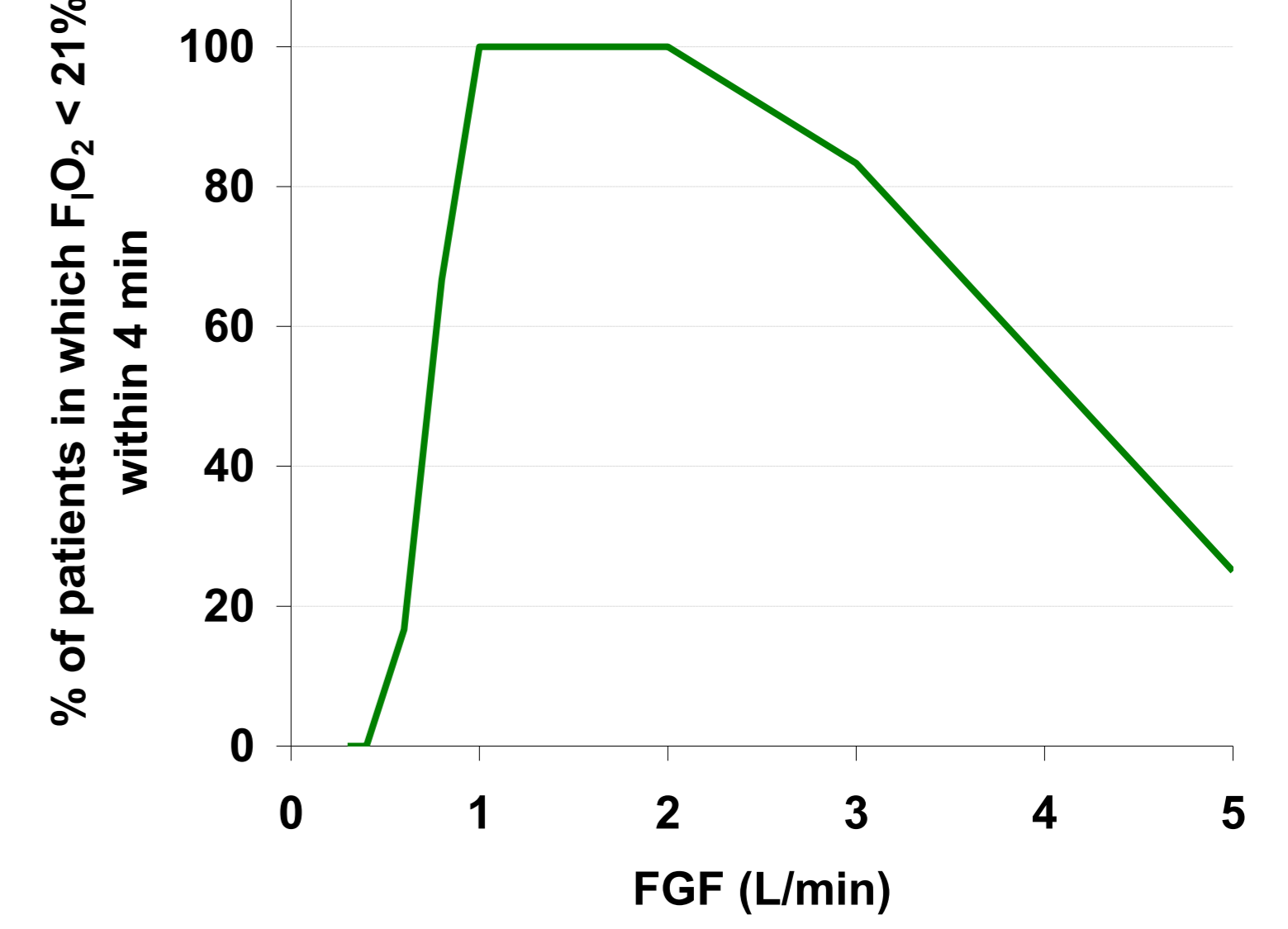


Figure 2. Incidence of $F_{iO_2} < 21\%$ within 4 min (expressed as % of population)

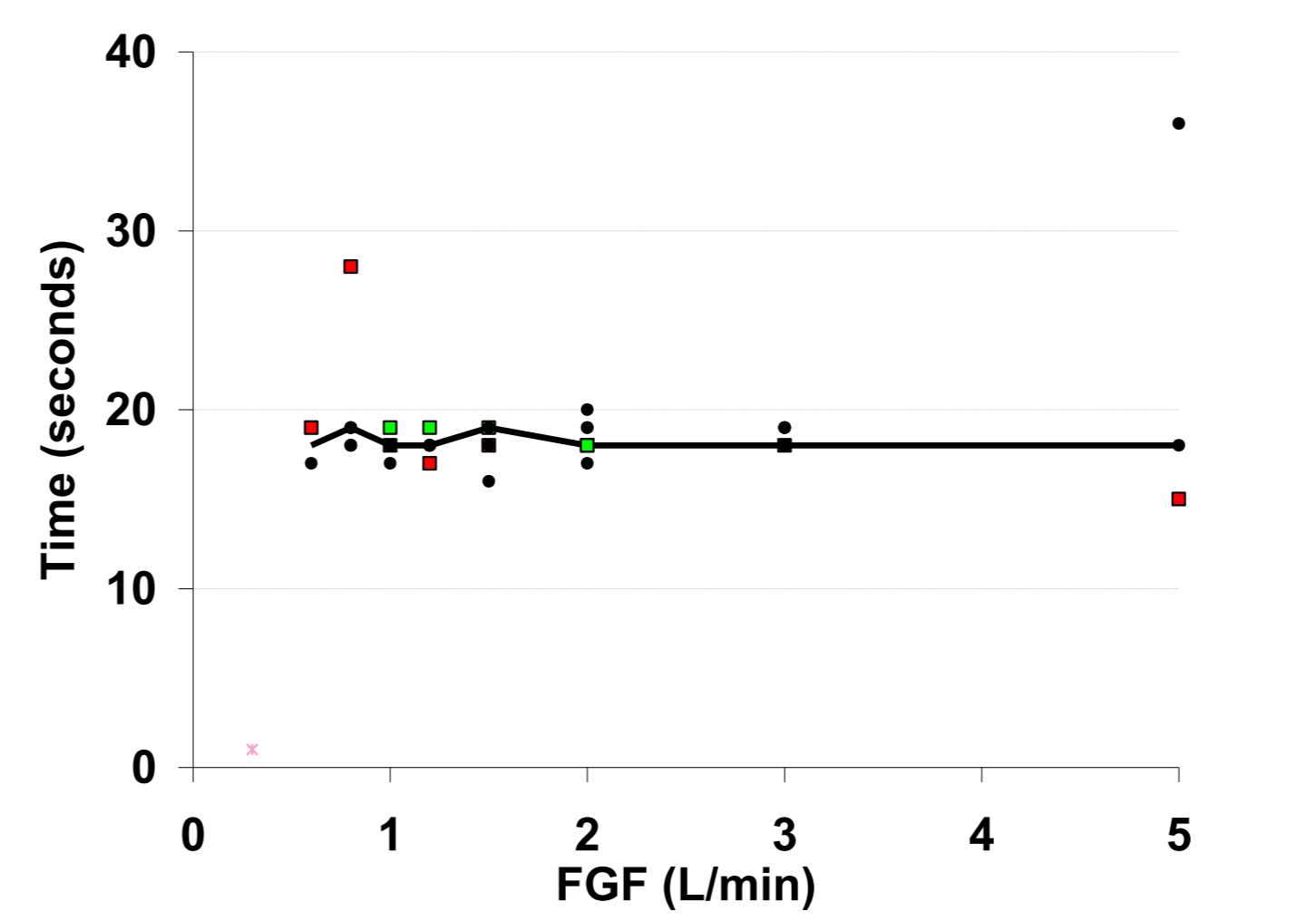


Figure 3. Time (sec) from $F_{iO_2} = 20\%$ till O_2 inspired O_2 Guard activation

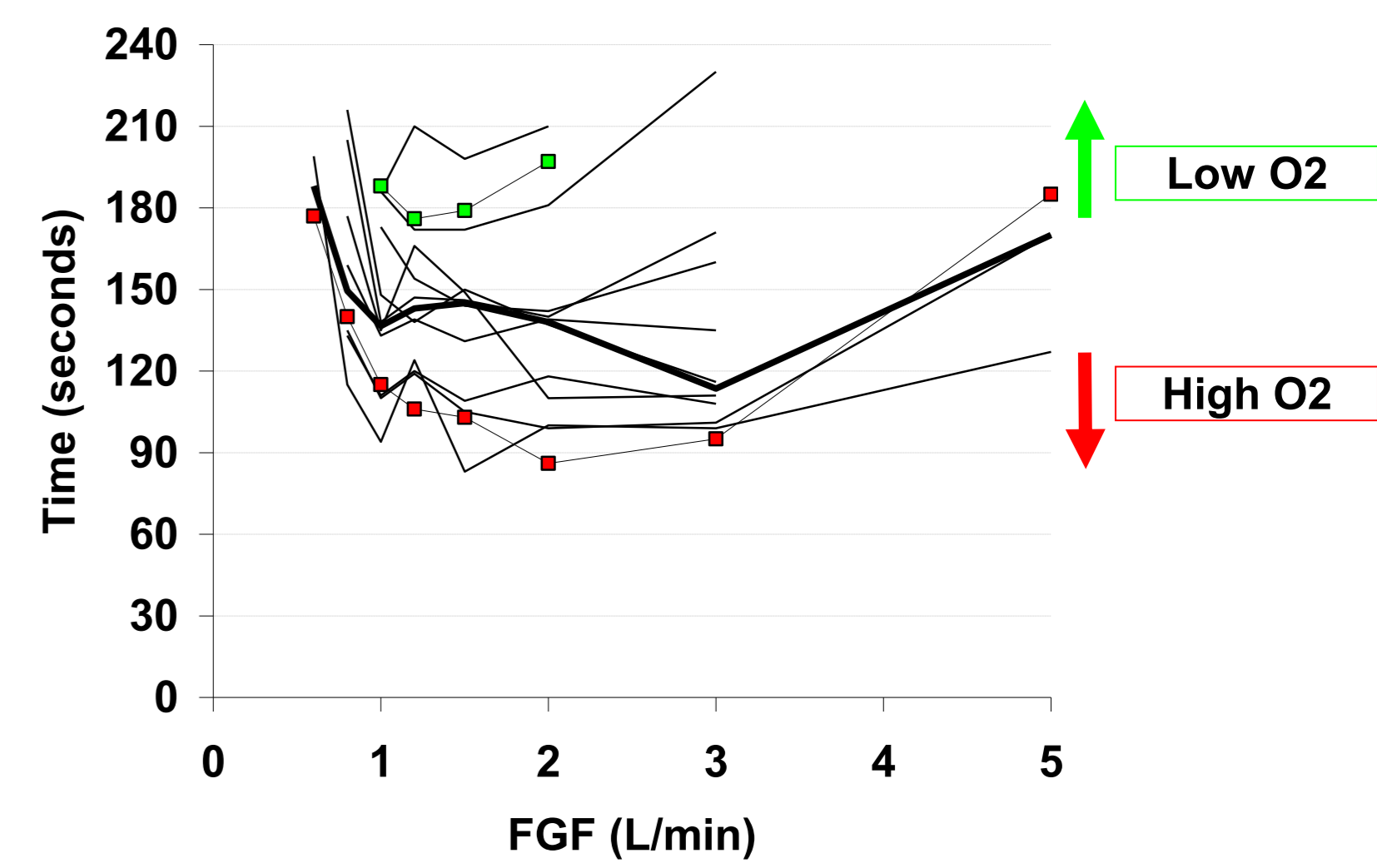


Figure 4. Time for F_{iO_2} to decrease from 30 to 21% *if it happened* (see figure 2)

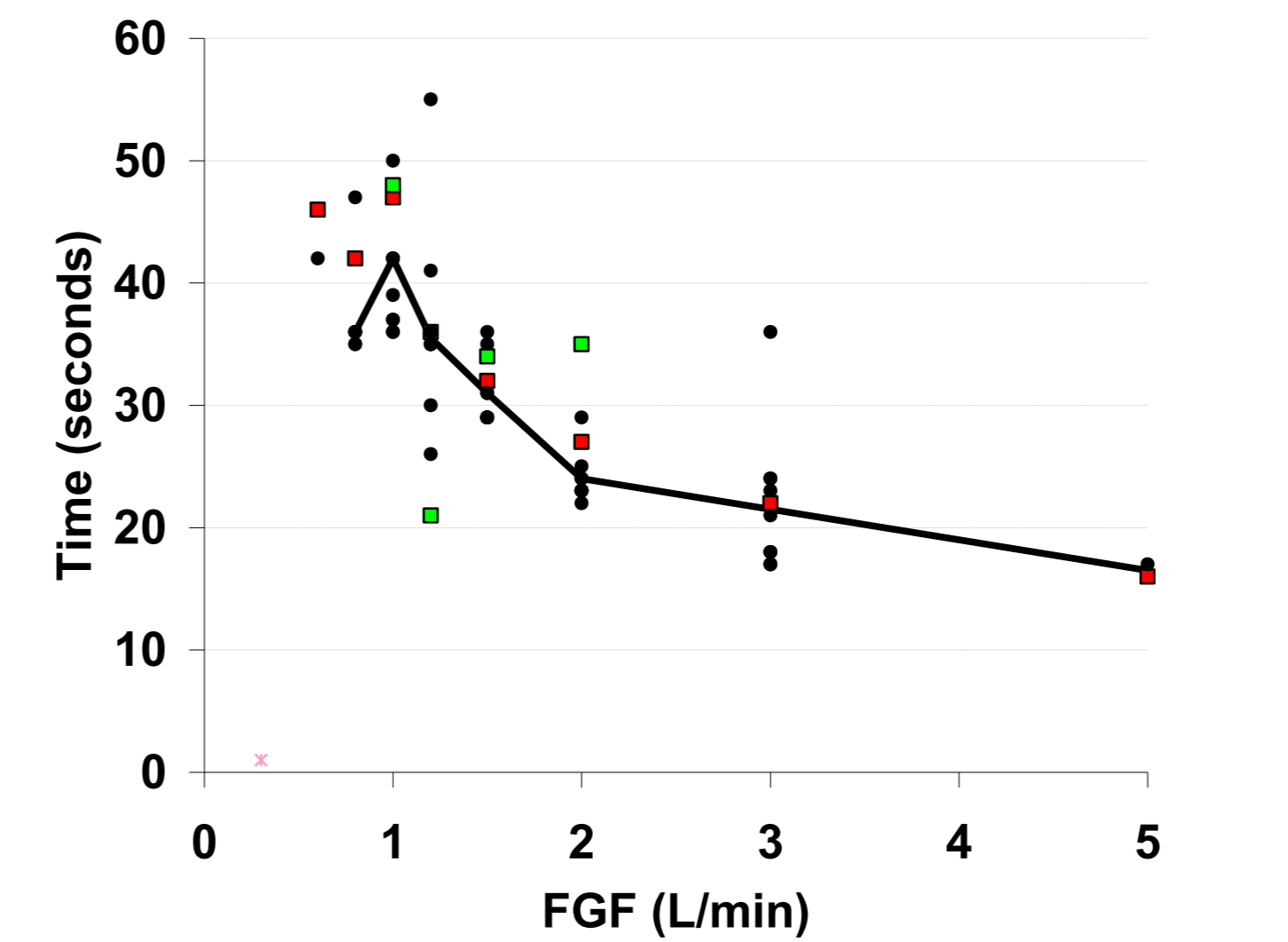


Figure 5. time (sec) from O_2 Guard activation until $F_{iO_2} = 25\%$

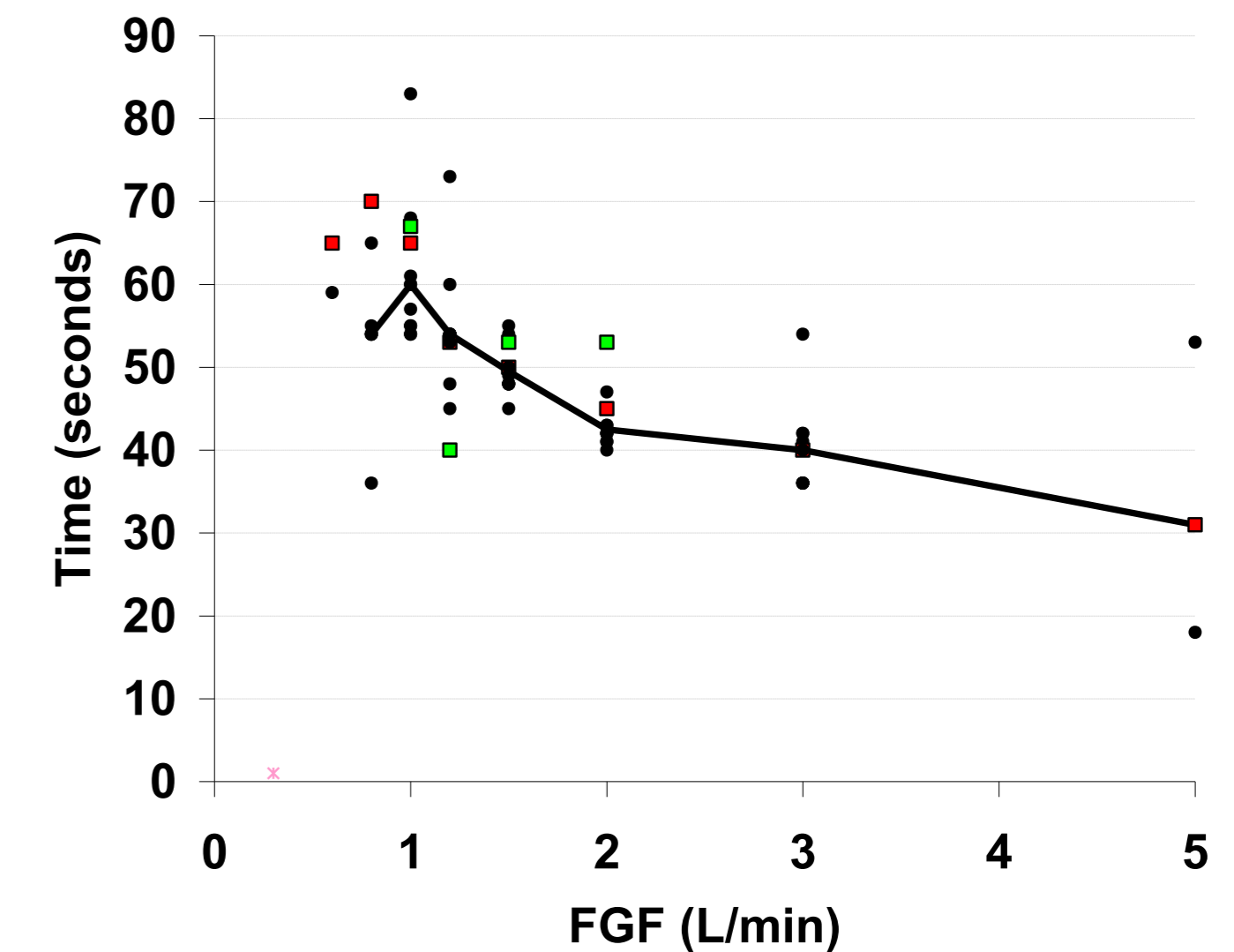


Figure 6. time (sec) from $F_{iO_2} = 20\%$ until return to $F_{iO_2} = 25\%$

Number	1	2	3	4	5	6	7	8	9	10	11	12
Procedure	Breast	Abd	Abd	Abd	Abd	Breast	Abd	Abd	Abd	breast	breast	breast
Age	52	74	65	35	61	78	56	68	59	62	80	44
Height	64	163	166	180	179	168	168	173	180	163	145	159
Weight	162	93	62	85	95	60	55	70	80	81	62	53
Gender	f	f	f	m	m	f	f	m	m	f	f	f

Patient demographics

Red = patient with relatively high O_2 uptake; green = patient with relatively low O_2 uptake

