

**Immediate use of a remotely monitored
ILR in diagnosing unexplained syncope:
The Second Eastbourne Syncope
Assessment Study (EaSyAS II)**

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Declaration of Interest

Dr Sulke has received research funding and speaker fees from Transoma Medical Inc (MN, USA)

Participants

- Primary Investigator:
Dr AN Sulke
- Statistician:
Prof N Freemantle
(University of Birmingham)
- Cardiology Team:
 - Dr NR Patel
 - Dr GW Lloyd
 - Dr SS Furniss
 - Dr P Hong
 - Dr R Veasey
 - Sister J Hunt
 - Medical / Nursing Staff
(CCU / Berwick)
- Implantation Trainers:
 - Dr Sulke, Dr Patel
- A+E Team:
 - Mr S Shubber, Mr U Shanker,
Medical & Nursing Staff
- Care of Elderly:
 - Dr M Fonseka, Dr A Nahhas,
Dr A Conrad, Dr A Karun
- MAU / Medical Directorate
 - Medical & Nursing Staff

(The study was partly supported by an unrestricted grant by Transoma Medical Inc., Minneapolis, Minnesota, USA)

EaSyAS II Study Design

- **Prospective, randomised, 2 X 2 factorial design.**

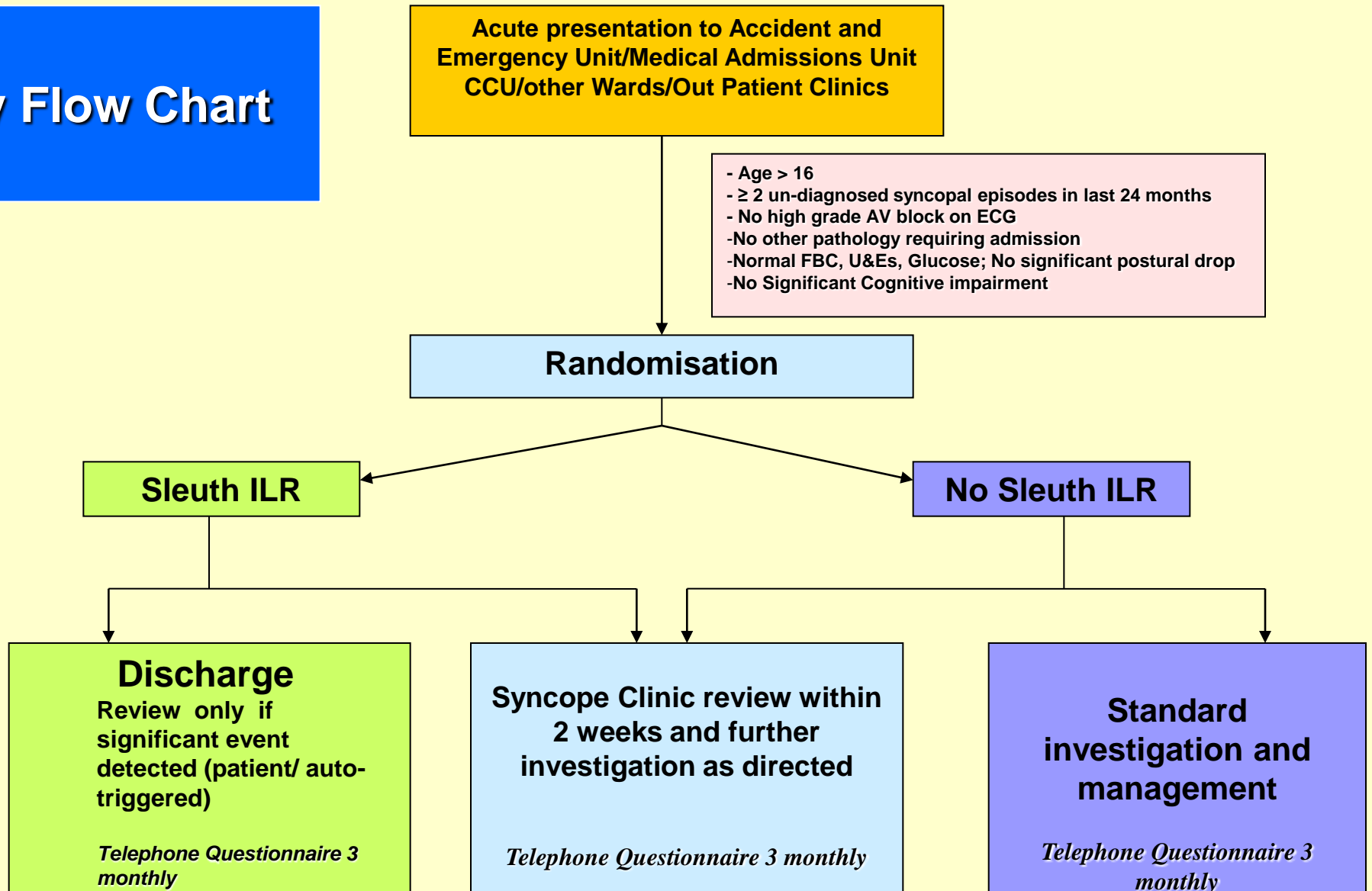
- **Aims:**

(i) to compare immediate 2nd Generation ILR implantation with remote monitoring, avoiding hospitalisation, with current standard protocol-directed management of syncope patients.

(ii) to assess cost effectiveness of the ILR as a diagnostic tool implanted without patient admission.

(iii) to concurrently evaluate the efficacy of a syncope/falls assessment clinic.

Study Flow Chart



Recruitment and Inclusion Criteria

The study completed recruitment with 246 patients:

Planned for 60 in each study limb.

INCLUSION CRITERIA

- Age > 16 yrs.
- Acute syncope presentation to A&E, MAU, CCU general cardiology/medical wards or clinics.
- 2 or more unexplained syncope episodes within the past 24 months including index episode.
- No high grade A-V block on ECG.
- Absence of co – existing pathology requiring hospital admission.

EXCLUSION CRITERIA

- Patients excluded if requiring admission for other co-morbidities or ECG abnormalities requiring further evaluation as in-patient (according to ESC guidelines 2004).
- Patients with events which indicated high risk were excluded:
 - Syncope during exercise
 - Sudden onset palpitations pre-syncope
 - Family Hx of sudden death
- Significant cognitive impairment (unable to set-up or activate ILR)

Outcome Measures, EaSyAS II

Primary Outcome

- Time to ECG diagnosis of syncope

Secondary Outcomes

- 1. Time to first post induction Syncope
- 2. Time to second post induction Syncope
- 3. Time to introduction of empiric therapy
- 4. Time to ECG directed therapy
- 5. Cost effectiveness analysis

Tertiary Outcomes

- 1. Subjective questionnaires (VAS scores)
- 2. Quality Of Life indices (SF-36, SF-6D)

Sleuth™ ILR System

- Device is slightly larger than a £2 coin.
- Flexible antenna. Implanted under local anaesthetic as a day case.
- Patient activator stores up to 630 minutes of data.
- Daily communication with Bluetooth™ enabled base station at home (within 30m).
- Patient's rhythm continuously monitored via internet and events reported immediately to clinician.
- Every heartbeat for 2+ years



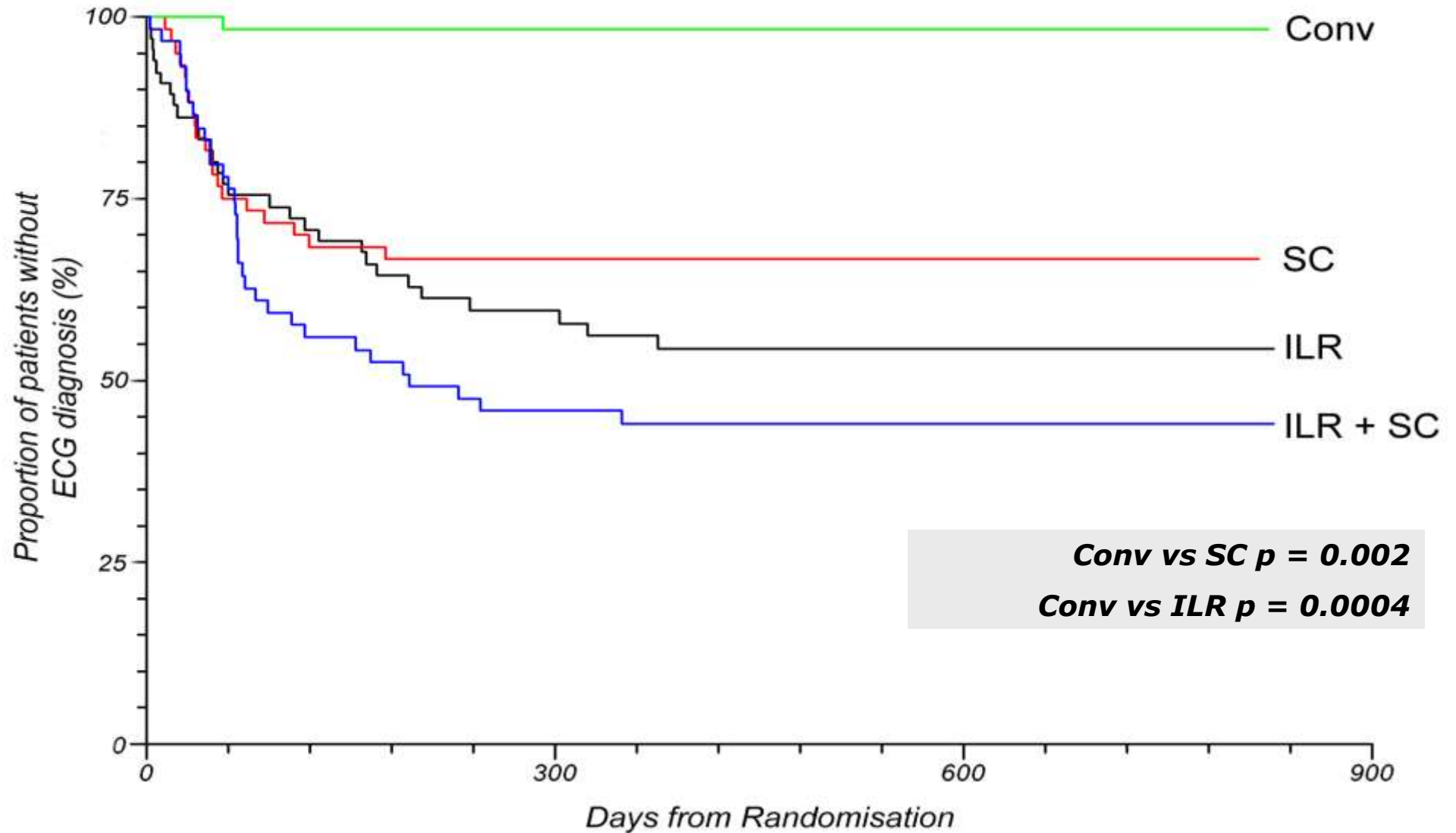
EaSyAS II: 126 Sleuth implants

- All implants undertaken from Aug 2007 to Dec 2008.
- Operators: 3 Cardiologists (2 senior, 1 Fellow) and 2 A+E Consultants.
- No peri-implant complications.
- Mean total procedure time: 34 min \pm 9.87 (Senior Cardiologists 21 min \pm 4.8, $p < 0.01$).
- 23 pts (18%) required phone assistance for ILR base station set-up, 17 (13%) required home visits.
- 62 (50%) achieved ECG diagnoses within mean 95.2 days post induction.
- All diagnoses achieved at first post-implant event (EaSyAS I: Reveal+ 53% diagnosed at first event $p < 0.01$)
- All patients followed for at least 1yr (range 12-28 months).
- Final Study census on 18/12/09.

EaSyAS II: Patient demographics by randomisation

	Conventional N=61	Syncope Clinic N=60	ILR N=66	ILR + Syncope Clinic N=59
Sex Male n(%)	29 (47.5%)	23 (38.3%)	25 (37.9%)	22 (37.3%)
DM n(%)	12 (19.7%)	5 (8.3%)	8 (12.1%)	9 (15.3%)
Hypertension n(%)	30 (49.2%)	21 (35.0%)	30 (45.5%)	22 (37.3%)
COPD n(%)	5 (8.2%)	1 (1.7%)	7 (10.6%)	2 (3.4%)
Epilepsy n(%)	1 (1.6%)	2 (3.3%)	5 (7.6%)	4 (6.8%)
Aspirin n(%)	31 (50.8%)	21 (35.0%)	31 (47.0%)	23 (39.0%)
Clopidogrel n(%)	6 (9.8%)	6 (10.0%)	4 (6.1%)	5 (8.5%)
β Blocker n(%)	20 (32.8%)	12 (20.0%)	13 (19.7%)	10 (17.0%)
ACE I n(%)	21 (34.4%)	9 (15.0%)	20 (30.3%)	17 (28.8%)
ARB n(%)	7 (11.5%)	6 (10.0%)	7 (10.6%)	7 (11.9%)
Statin n(%)	26 (42.6%)	15 (25.0%)	28 (43.1%)	23 (39.0%)
Age mean (sd)	73.0 (14.6)	63.9 (22.7)	72.1 (16.7)	72.0 (16.2)

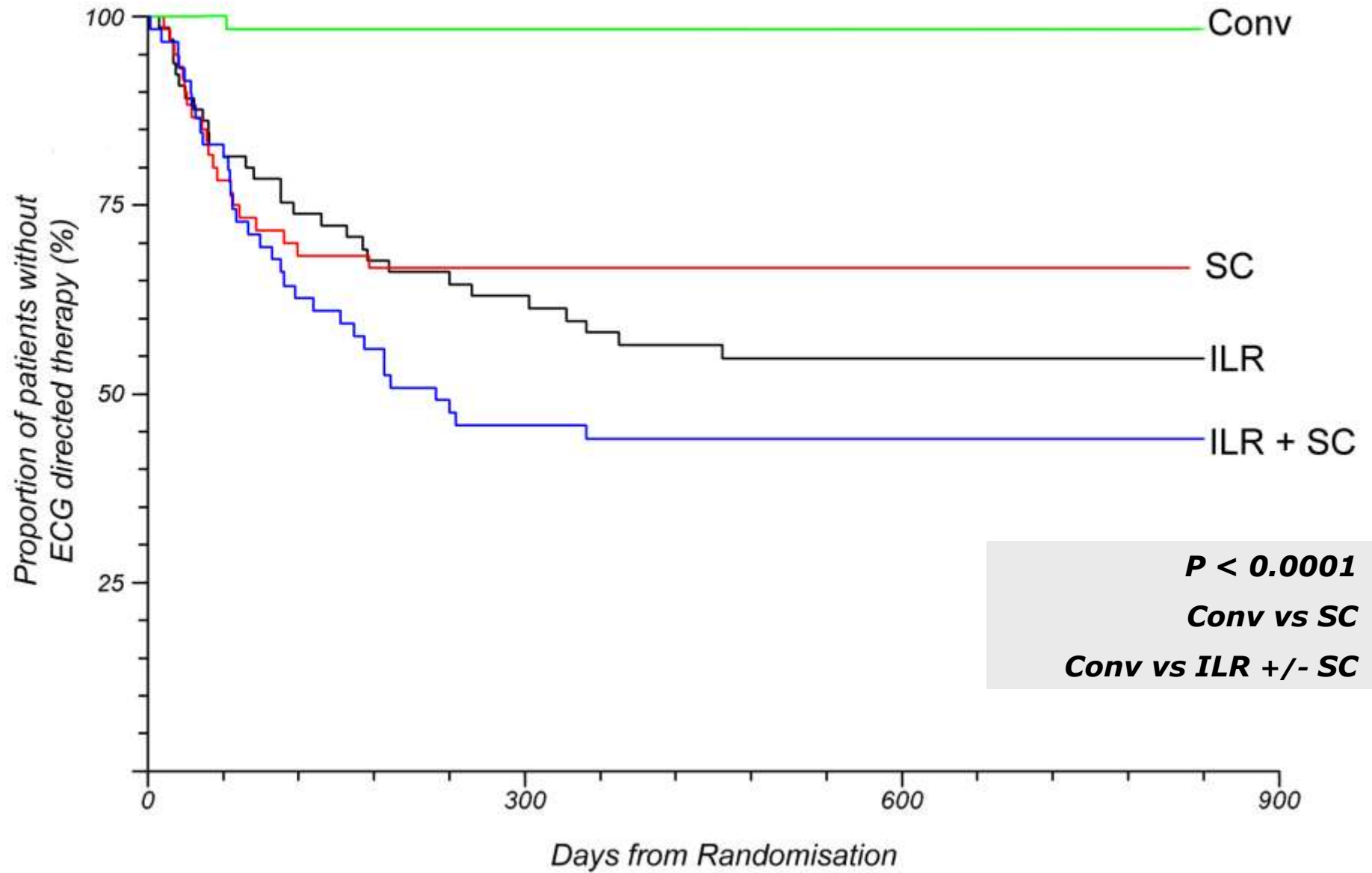
Time to ECG Diagnosis



Frequency of ECG directed therapy

	Conventional	Syncope Clinic	Implantable loop recorder (ILR)	ILR + Syncope Clinic	Total
Total number of patients	61	60	66	59	246
Number of patients with ECG directed therapy (%)	1 (1.6)	20 (33.3)	29 (43.9)	33 (55.9)	83 (33.7)

Time to ECG directed Therapy

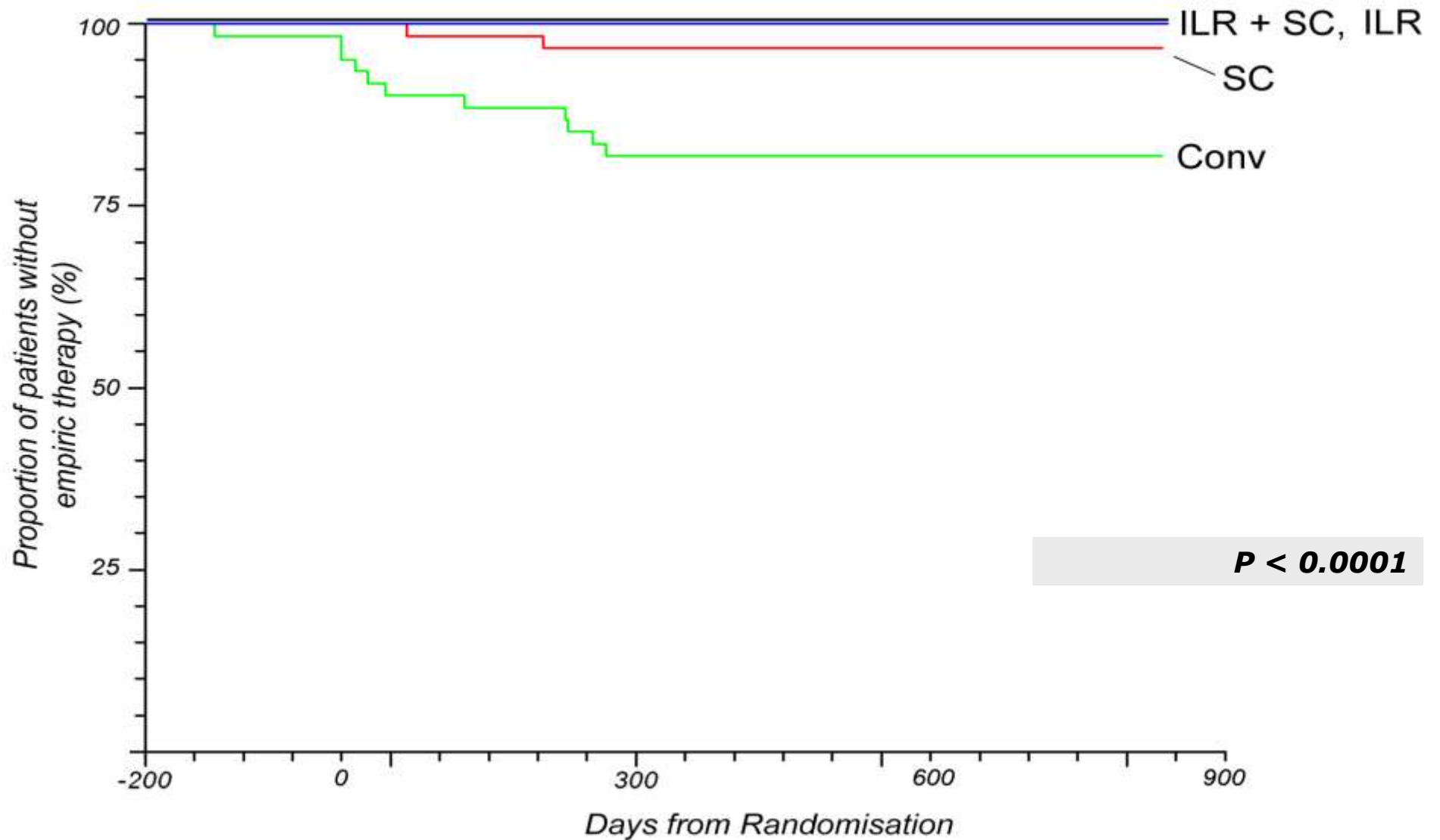


$P < 0.0001$
Conv vs SC
Conv vs ILR +/- SC

Investigations per randomised group at study census

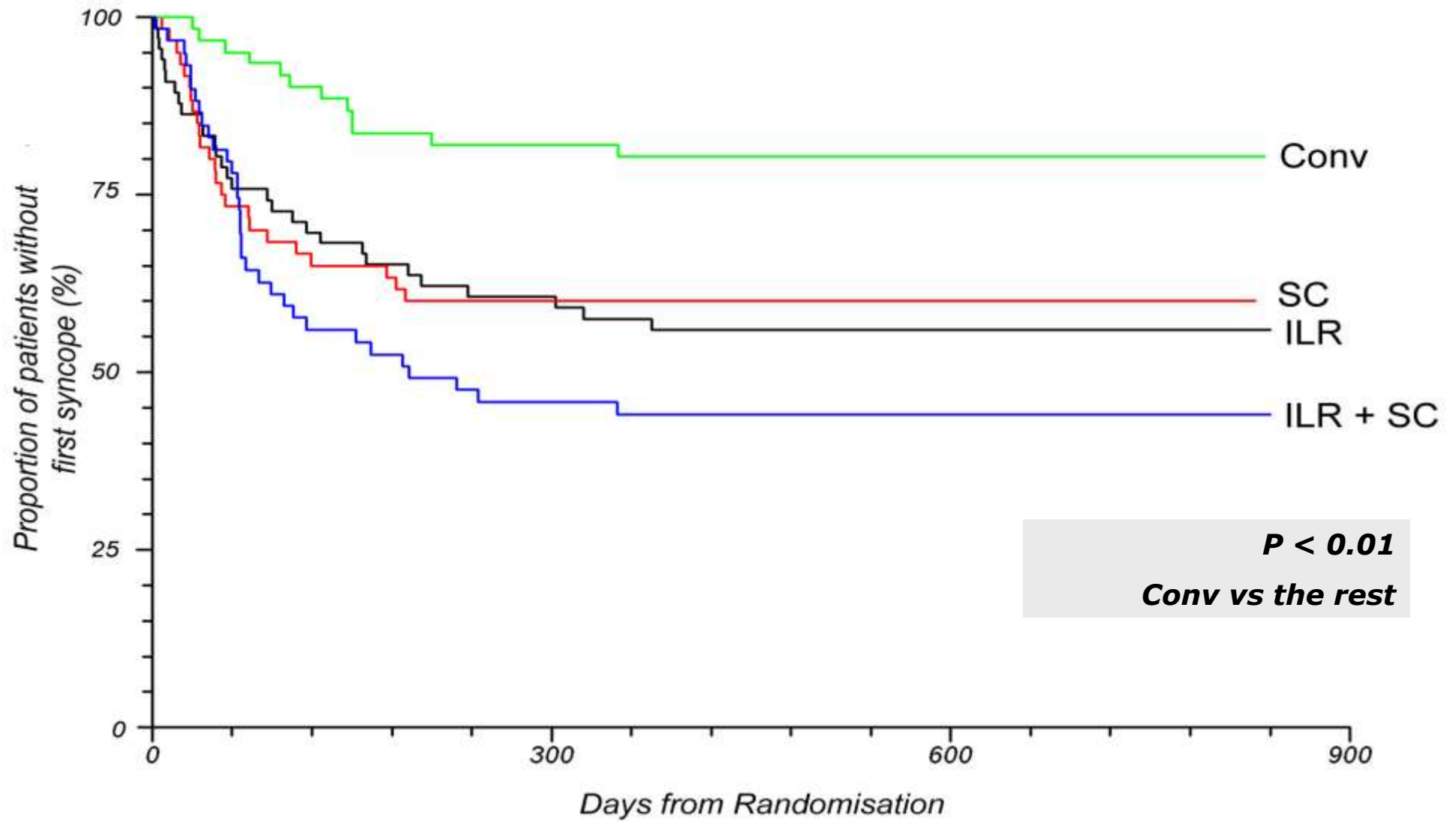
Investigation	Conventional N=61	Syncope Clinic N=60	ILR N=66	ILR + Syncope Clinic N=59
Echo	37	13	19	3
Tilt test	1	55	2	53
ILR	1	0	-	-
MIBI scan	1	1	2	0
CT head	3	1	9	1
ETT	9	4	1	0
Coronary angio	1	0	2	0
EEG	2	0	1	0
24 hour holter	27	1	6	1
ELR	25	2	0	0
MRI head	7	0	1	0
Carotid dopplers	3	0	2	0
EMG	0	0	1	0
24 hour BP	0	0	2	0
Stress echo	3	0	0	0
Sleep studies	1	0	0	0
CT angio	1	0	0	0
Total	122	77	48	58

Time to Empiric Therapy

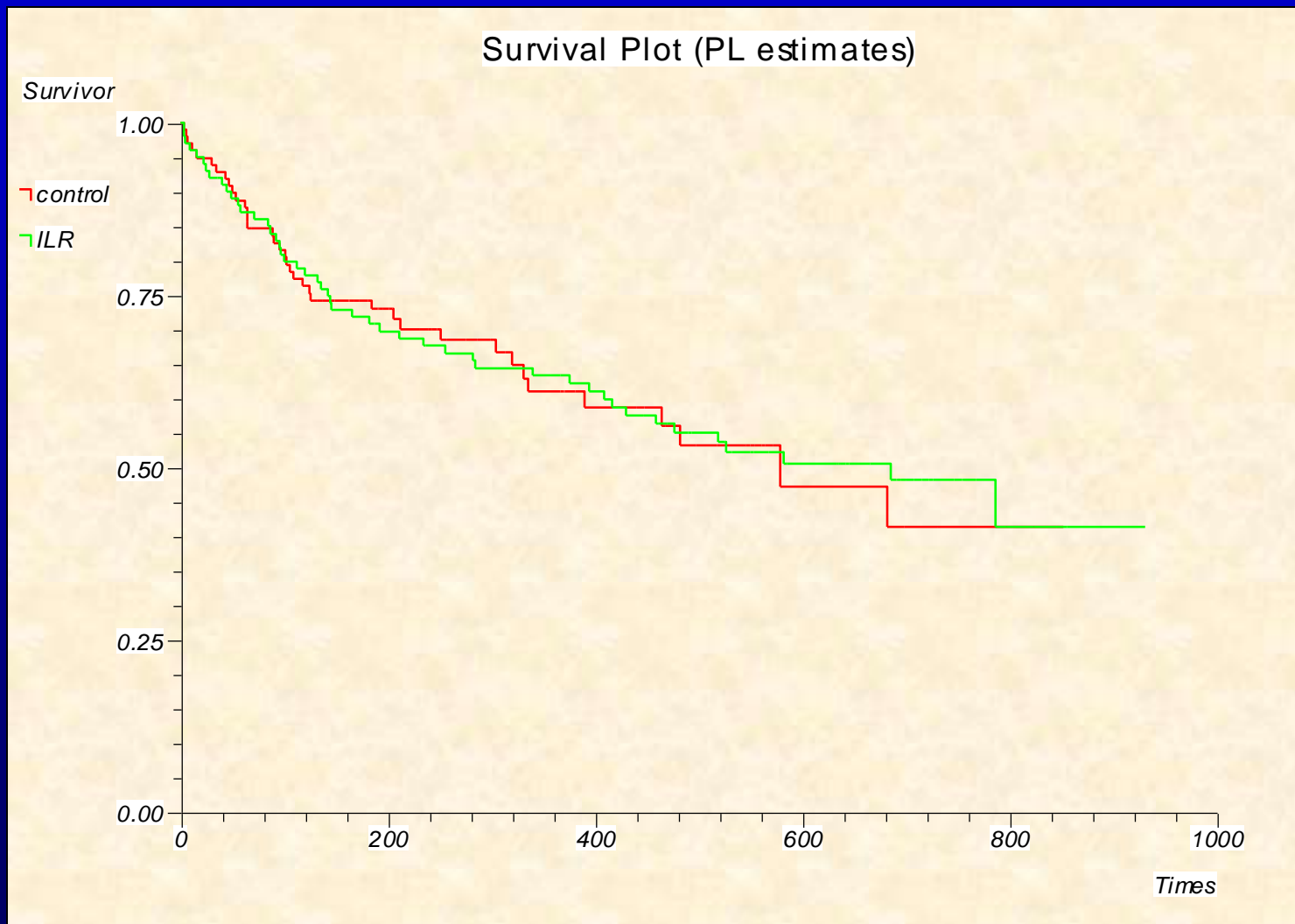


$P < 0.0001$

Time to first post-induction syncope



EaSyAS I: Reveal+ ILR, Time to first syncope recurrence vs Conventional Rx in 2000/2001



Hazard Ratio

1.01

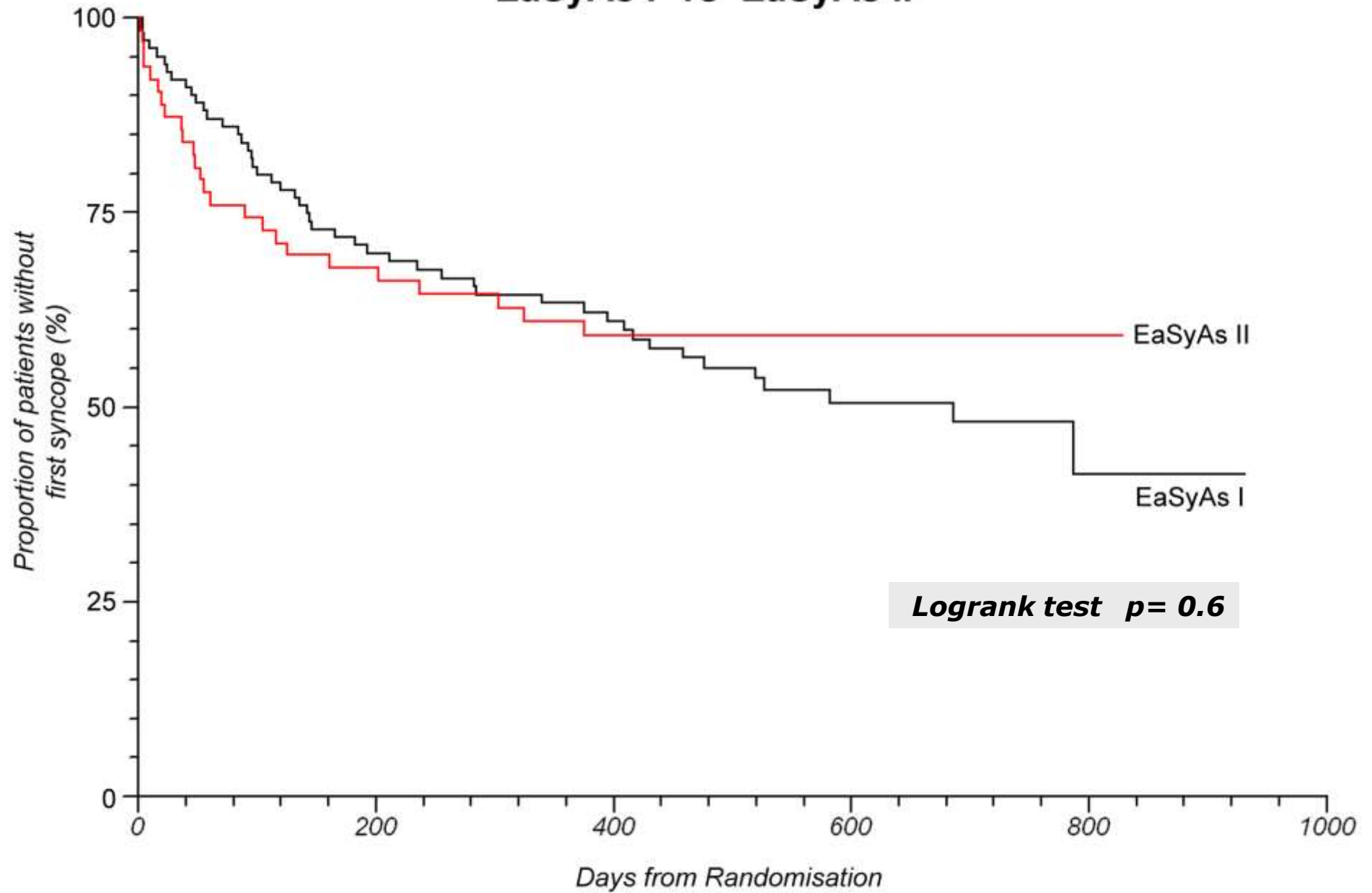
95% CI

0.661-1.55

P

0.953

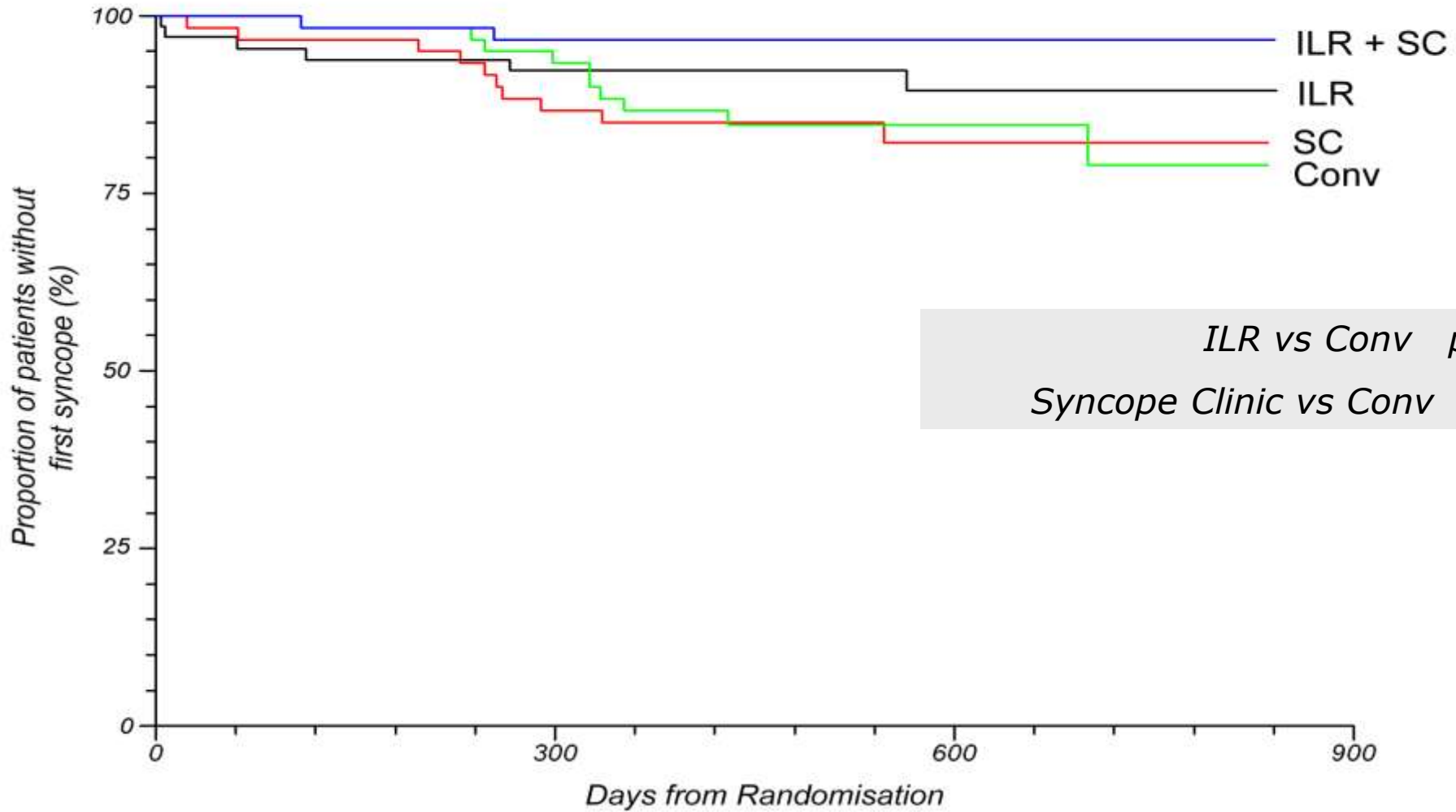
Time to First Syncope EaSyAs I vs EaSyAs II



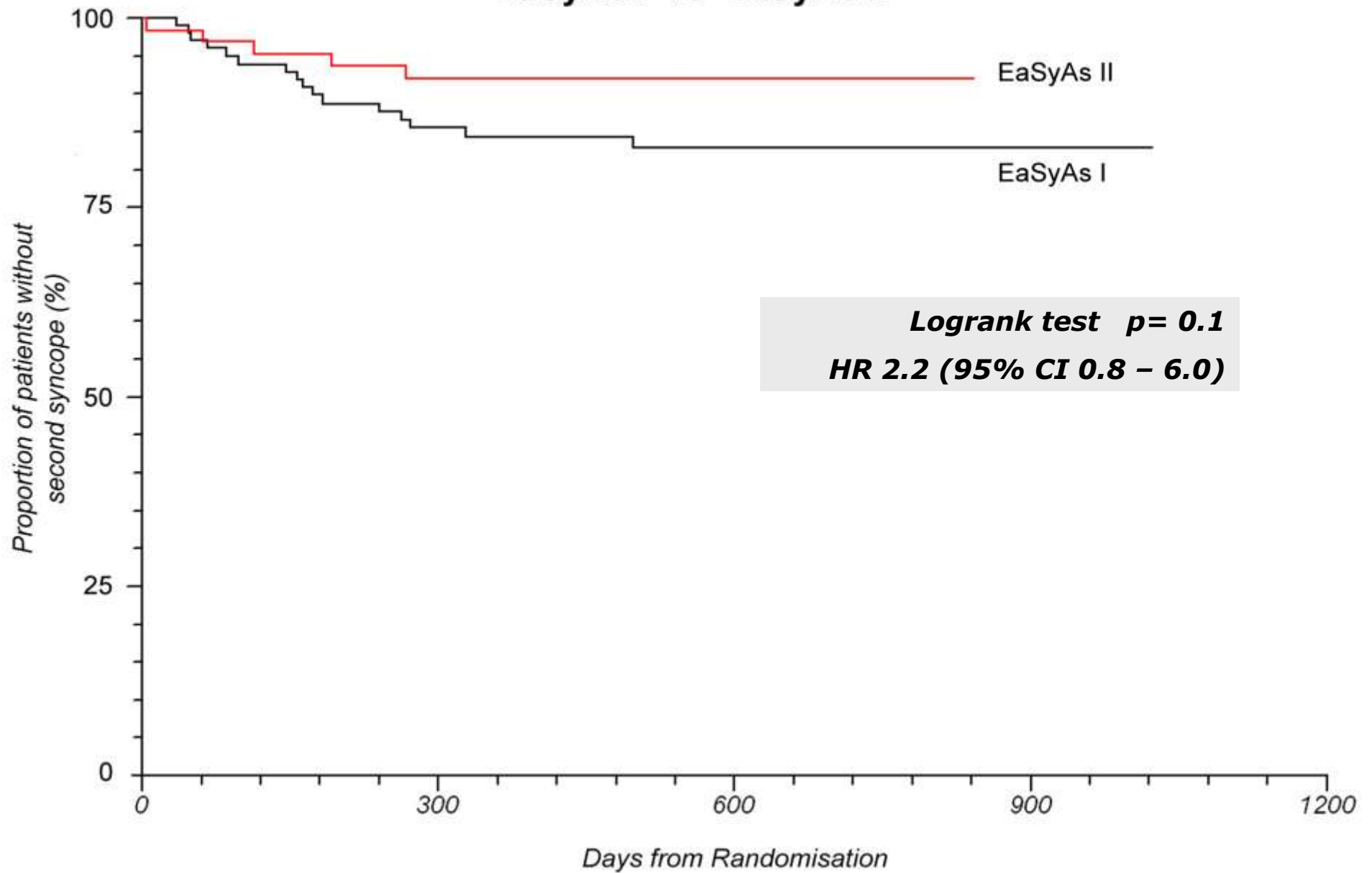
Diagnoses achieved and interventions undertaken

	Conventional	Syncope Clinic	Implantable loop recorder (ILR)	ILR + Syncope Clinic
ECG diagnoses	1	21	30 (10 – sinus rhythm during syncope)	33 (3 – sinus rhythm during syncope)
Non ECG diagnoses (Clinical)	11	2	0	0
Empiric therapy	11	2	0	0
ECG directed therapy	1	21	30	33
Invasive interventions				
<i>PPM/ICD</i>	1	3	13	15
<i>EP / Ablation</i>	-	-	2	2
Non-invasive interventions				
<i>Psychiatric referral</i>	-	-	1	1
<i>Medication Adjustment</i>	10	5	4	1
<i>Supportive / monitor</i>	-	-	6	4
<i>Lifestyle modification + counter measures</i>	5	17	6	15
Total Interventions	16	25	32	38
(% invasive)	(6.25%)	(12%)	(46.9%)	(44.7%)

Time to second post-induction syncope



Time to Second Syncope EaSyAs I vs EaSyAs II



Comparative cost per ECG diagnosis

(HRG 4 Tariffs, 2009 NHS costs)

	Cost	Lower/Upper 95% CI
ILR vs Conventional therapy	£1017	- £24 / £2046
SC vs Conventional therapy	- £2220	- £4559 / - £826
ILR + SC vs Conventional therapy	£1656	£847 / £2518
ILR + SC vs ILR	£32537	-

Mean Cost per QALY

(using SF6D derived values for utility)

	Cost	Lower/Upper 95% CI
ILR vs Conventional therapy	£8156	- £109038 / £116988
SC vs Conventional therapy	- £8649	- £43444 / - £2830
ILR + SC vs Conventional therapy	£9952	£3478 / £47975

EaSyAS II confirms RM ILR Benefits

- Continuous remote monitoring and the enhanced memory capacity of the Sleuth device has prevented any significant loss of data improving rate & quality of diagnosis compared to conventional ILRs
- RM ILR patients should require no hospital visits to achieve syncope diagnosis, & in many cases, were alerted to attend by the physician, solely to institute therapy, making review entirely specific.
- As ILR implantation was undertaken without complications by both A+E clinicians & Cardiologists in the A+E Theatre, unnecessary admission & inappropriate onward referral has been avoided.

THIS HAS ENHANCED RM ILR COST EFFICIENCY

Conclusions

- The Syncope Assessment Clinic **SAVES** money compared to Conventional Syncope Management and should be widely available in the NHS
- Immediate use of a remotely monitored ILR implanted without hospital admission is highly cost effective by NICE criteria
- Syncope achieving an ECG diagnosis which requires Device/EP therapy results in a significant improvement in Syncope symptoms which is not seen with medical & lifestyle modification therapies