CRITICAL ISSUES 20TH INTERNATIONAL EXPERTS SYMPOSIUM in aortic endografting 2016
May 20 & 21, 2016 - BARRIÈRE HOTEL - LILLE - FRANCE

When and where EVAR patients should be discharged?

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Disclosure of Interest

20th INTERNATIONAL EXPERTS SYMPOSIUM
CRITICAL ISSUES
in aortic endografting 2016
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I have the following potential conflicts of interest to report:

- Consulting
  - ✓ Bolton medical, Cook Medical , Medtronic, Philips Medical

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Nowadays, EVAR is the preferred treatment in patients with “suitable anatomy”

ORIGINAL ARTICLE

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Long-Term Outcomes of Abdominal Aortic Aneurysm in the Medicare Population

Schermerhorn, et al. NEJM 2015:373:3238-38

- 79,932 patients with elective repair for AAA
- Treated from 2001 – 2008
- Followed through 2009
- Two matched groups (39,966 EVAR & 39,966 open repair)

Table 3. Eight-Year Outcomes after Endovascular and Open Repair of Abdominal Aortic Aneurysm.

Outcome	Endovascular Repair (N=39,966)	Open Repair (N=39,966)	P Value
	*no. of patients (%)**		
Death	14,548 (54.9)	14,681 (54.7)	0.76
Rupture of aneurysm	962 (5.4)	353 (1.4)	<0.001
Any aneurysm-related intervention	4,165 (18.8)	754 (3.7)	<0.001

Follow-up needed AFTER EVAR!!!

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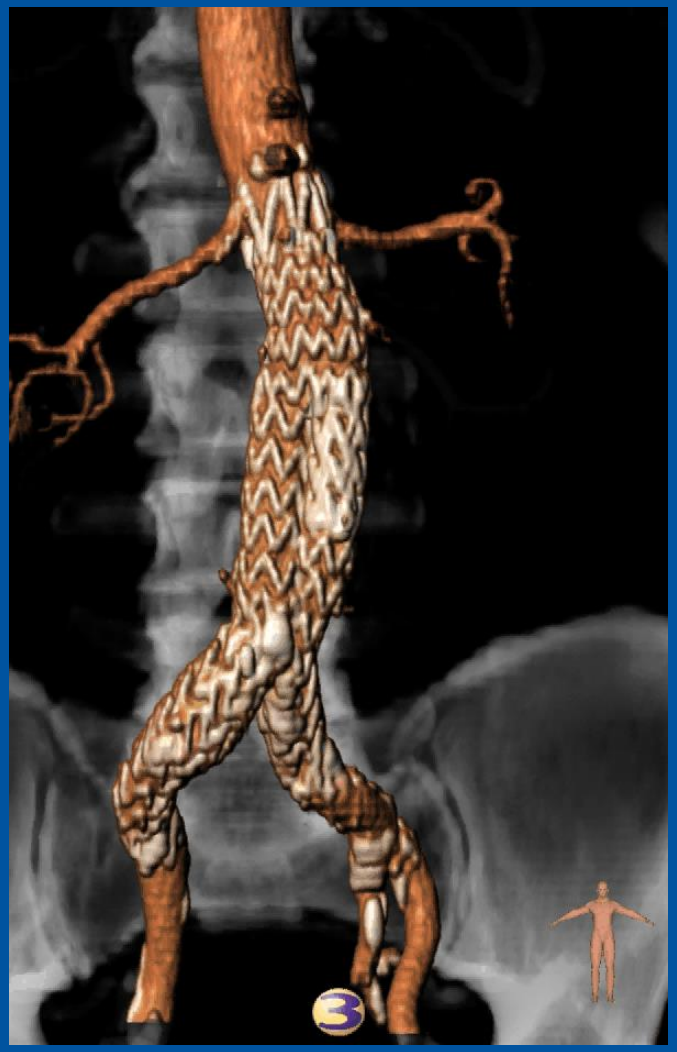

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Where to focus on during Follow- up?

Rate and Predictability of Graft Rupture After Endovascular and Open Abdominal Aortic Aneurysm Repair

Data From the EVAR Trials

Thomas R. Wyss, MD, Louise C. Brown, PhD, Janet T. Powell, MD, and Roger M. Greenhalgh, MA, MD, MChir, FRCS

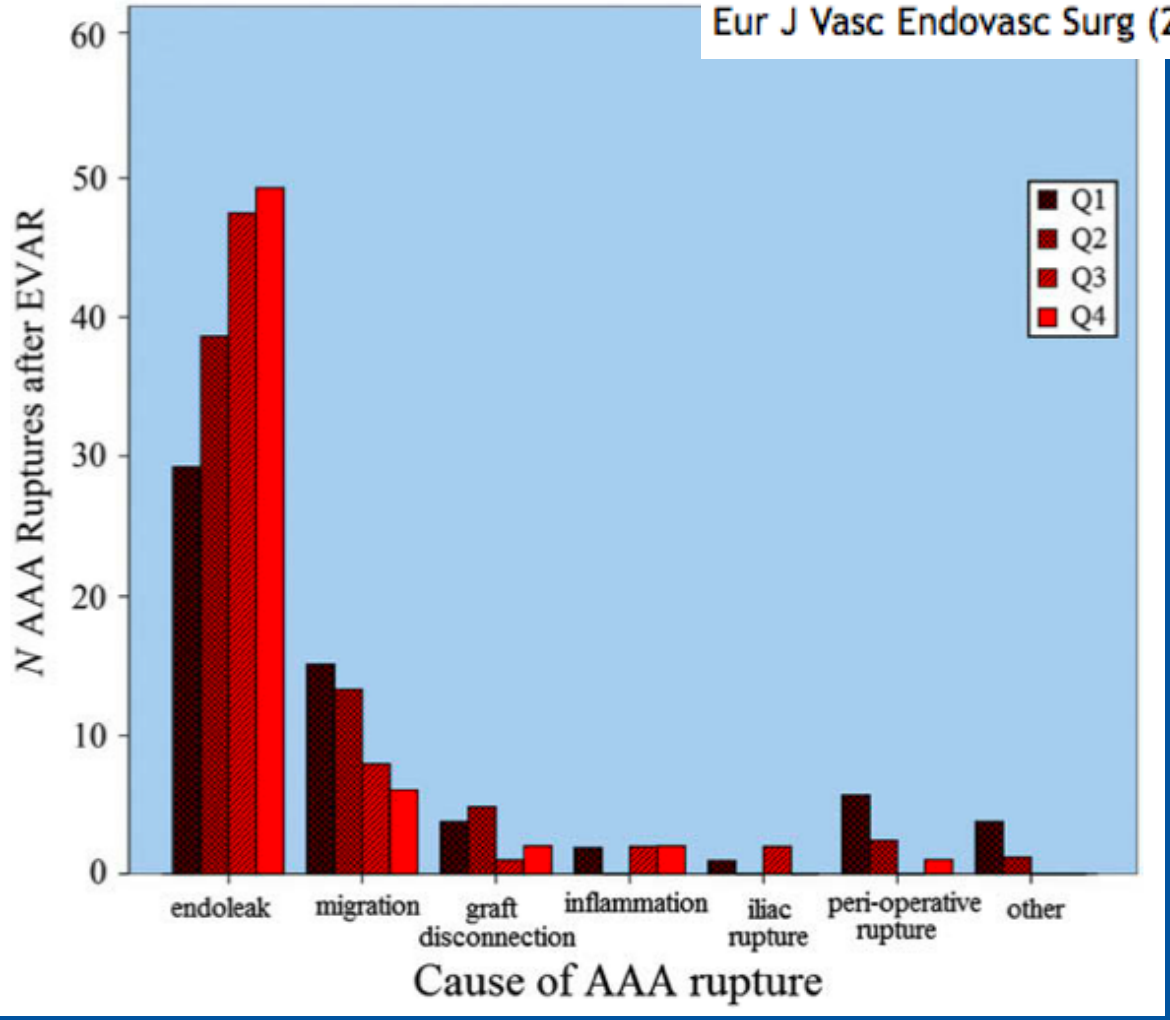
(*Ann Surg* 2010;252:805–812)

- Annual Rupture risk
  - 0.4% without endoleak/ migration
  - 2.4% when Type I Endoleak / migration / Type II with sac growth

Aneurysm Rupture after EVAR: Can the Ultimate Failure be Predicted?

F.J.V. Schlösser [a], R.J. Gusberg [a], A. Dardik [a], P.H. Lin [b], H.J.M. Verhagen [c], F.L. Moll [d], B.E. Muhs [a,*]

Eur J Vasc Endovasc Surg (2009) 37, 15–22



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- Endoleak is the main cause of post EVAR rupture

Aneurysm Rupture after EVAR: Can the Ultimate Failure be Predicted?

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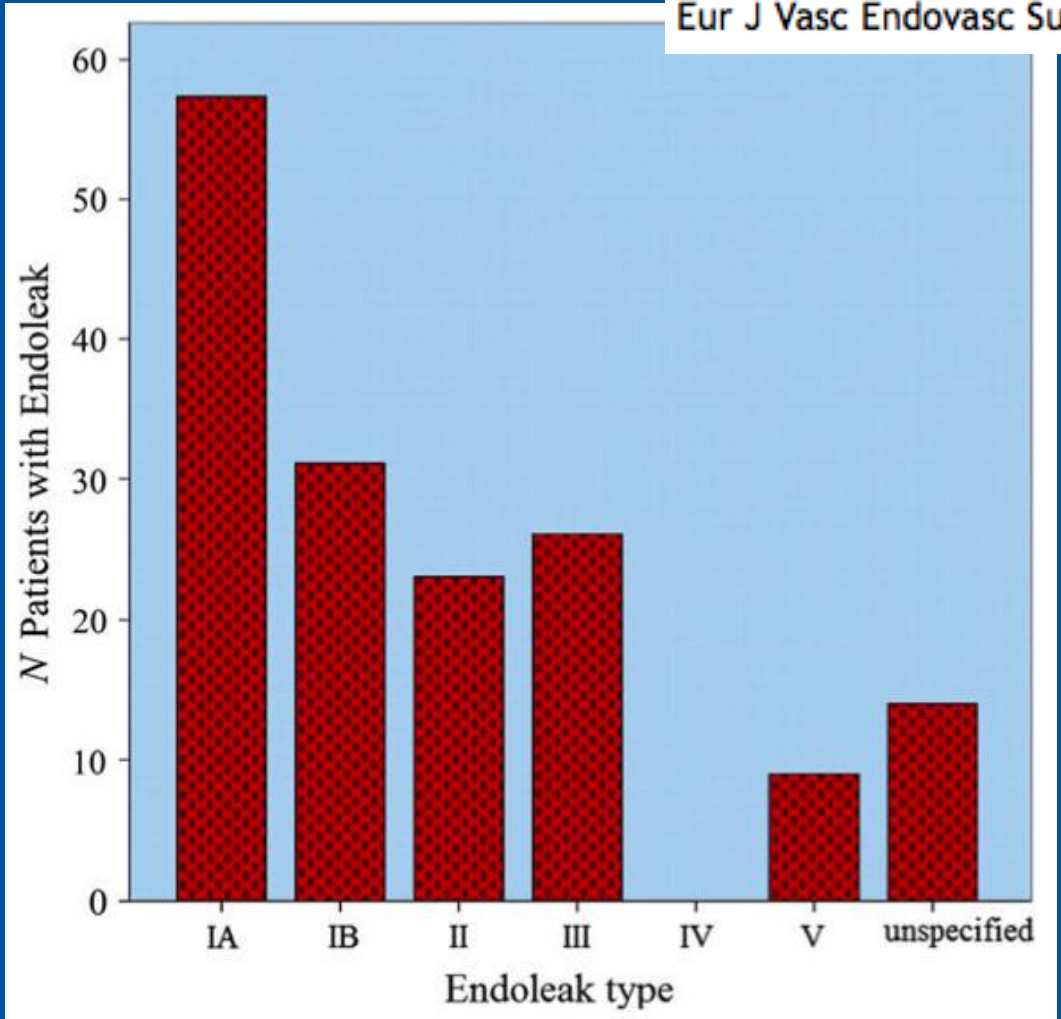

From the Society for Vascular Surgery

Annual rupture risk of abdominal aortic aneurysm enlargement without detectable endoleak after endovascular abdominal aortic repair

Dave Koole, MD,[a,b] Frans L. Moll, MD, PhD,[a] Jacob Buth, MD, PhD,[c] Roel Hobo, PhD,[c] Herman J. A. Zandvoort, MD,[a] Michiel L. Bots, MD, PhD,[d] Gerard Pasterkamp, MD, PhD,[b] and Joost A. van Herwaarden, MD, PhD,[a] for the European Collaborators on Stent-Graft Techniques for Aortic Aneurysm Repair (EUROSTAR), *Utrecht and Eindhoven, The Netherlands*

(J Vasc Surg 2011;54:1614-22.)

- 6337 pts included 1996 - 2006
- Annual rupture rate without detectable endoleak is very low (≤ 0,5%) during first years of FU[3]

- Important: Focus on post EVAR enlargement caused by endoleaks

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- Goal of Follow-up after EVAR is to detect aneurysm growth and secondary to that detect an endoleak

Endoleak detection

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- Duplex Ultrasound (DU)
- Contrast Enhanced Ultrasound (CEUS)
- CT Angiography
- MR / MRA
- DSA

Duplex Ultrasound

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Author, journal, year	Number of scan pairs	Total number of endoleaks in DU / CTA	Number of Type II endoleaks on DU / CTA	Sensitivity DU	Specificity DU
Mirza, Eur. J. Vasc. Endovasc. Surg., 2010 (Review – pooled data)	2610	446/ 439	NR / NR	77% (64% - 86%)	94% (88% - 97%)
Schmieder, J. Vasc. Surg., 2009	472	110 / 75	99 / 66	64%	86%
Manning, J. Vasc. Surg., 2009	406	24 / 21	19 / 18	86%	67%
Cantisani, Eur. Radiol., 2011	108	14 / 24	NR / 18	58%	93%

Duplex Ultrasound

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- No ionizing radiation or Contrast
- Cheap
- In general sensitivity is moderate to low & Highly operator dependent

Contrast Enhanced Ultrasound

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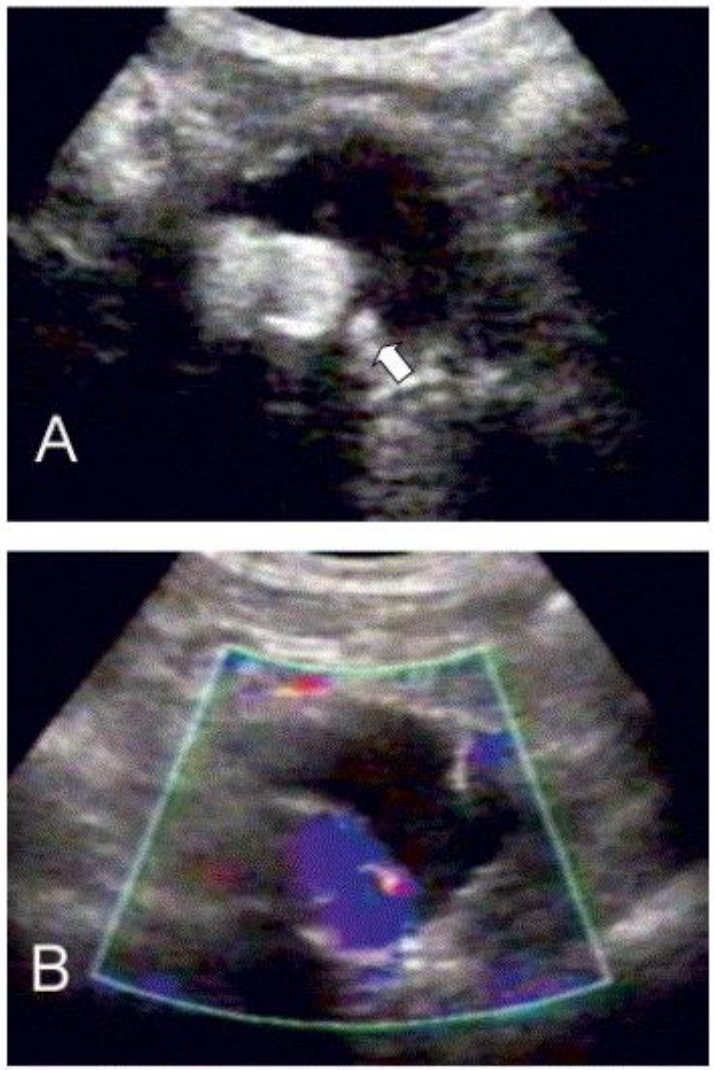
Author, journal, year	Number of scan pairs	Total number of endoleaks on CEUS / CTA	Number of Type II endoleaks on CEUS / CTA	Sensitivity CEUS	Specificity CEUS
Mirza, Eur. J. Vasc. Endovasc. Surg., 2010 (Review – pooled data)	285	103 / 80	NR / NR	98% (90% - 99%)	88% (78% - 94%)
Perini, Eur. J. Vasc. Endovasc. Surg., 2011	395	103/99	82/78	NR	NR
Cantisani, Eur. J. Vasc. Endovasc. Surg., 2011	108	23/20	NR/18	96%	100%



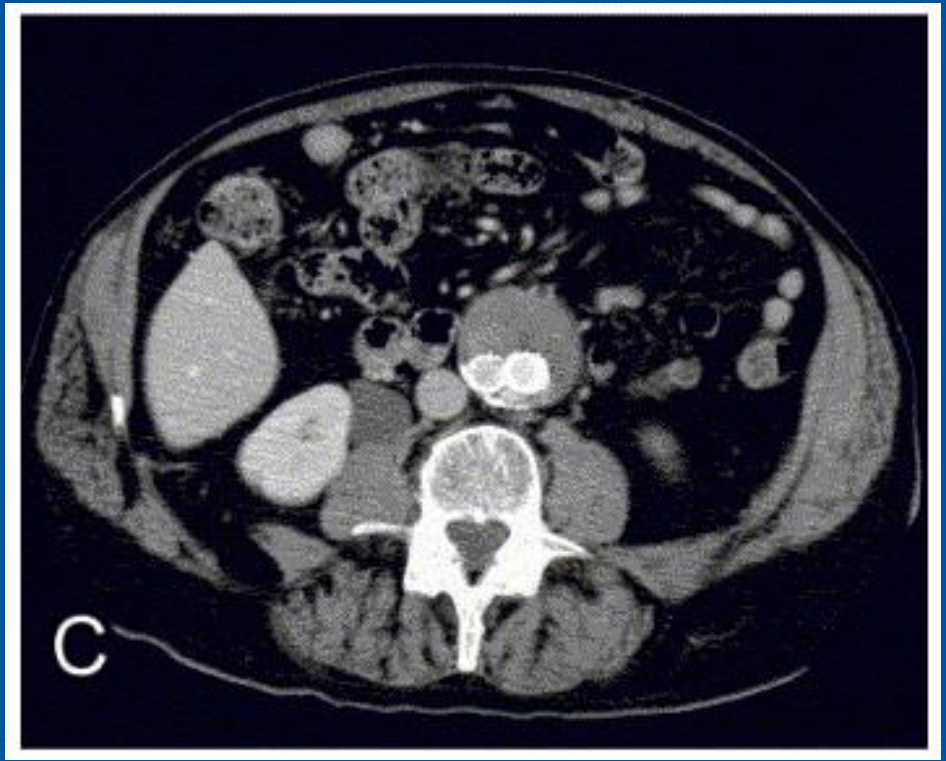


Fig 2. A, Cross-sectional contrast-enhanced ultrasound image of main body of aortic endograft with a small type II endoleak *(arrow)*. **B,** A cross-sectional color duplex ultrasound scan of same patient shows no evidence of endoleak. **C,** Computed tomography angiography of the same patient demonstrates no endoleak.

Henao, et al. J Vasc Surg 2006;43:259-64.

Contrast Enhanced Ultrasound

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- CEUS shows promising results in literature and is comparable to CTA.
- Also CEUS is operator dependent
- Not preferable as sole imaging modality during FU (inadequate for migration & stent fractures)

CTA

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- Three phase CTA
  - Without Contrast
  - Early phase
  - Late Phase (60-120 seconds)

“GOLD STANDARD”

CTA

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- High Sensitivity & Specificity in EL detection
- Radiation & contrast exposure
- Origin of the endoleak (direction of bloodflow not to determine)

MRI

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Author, journal, year	Number of scan pairs	Total number of endoleaks on MRI / CTA	Number of Type II endoleaks on MRI / CTA	Sensitivity MRI	Specificity MRI
Haulon, Eur. J. Vasc. Endovasc. Surg., 2001	31	18 / 10	17 / 9	94%	83%
Cejna, Eur. Radiol., 2002	18	9 / 8	6 / 5	NR	NR
Van der Laan, Eur. J. Vasc. Endovasc. Surg., 2006	35	23 / 11	6 / 3	NR	NR
Alerci, Eur. Radiol., 2008	43	22 / 11 24 / 12	19 / 10 13 / 7	100% 95%	92% 81%
Cornelissen, Invest. Radiol., 2010	11	6 / 0	1 / 0	NR	NR
Cantisani, Eur. J. Vasc. Endovasc. Surg., 2011	108	24 / 20	21 / 18	96%	100%

MRI

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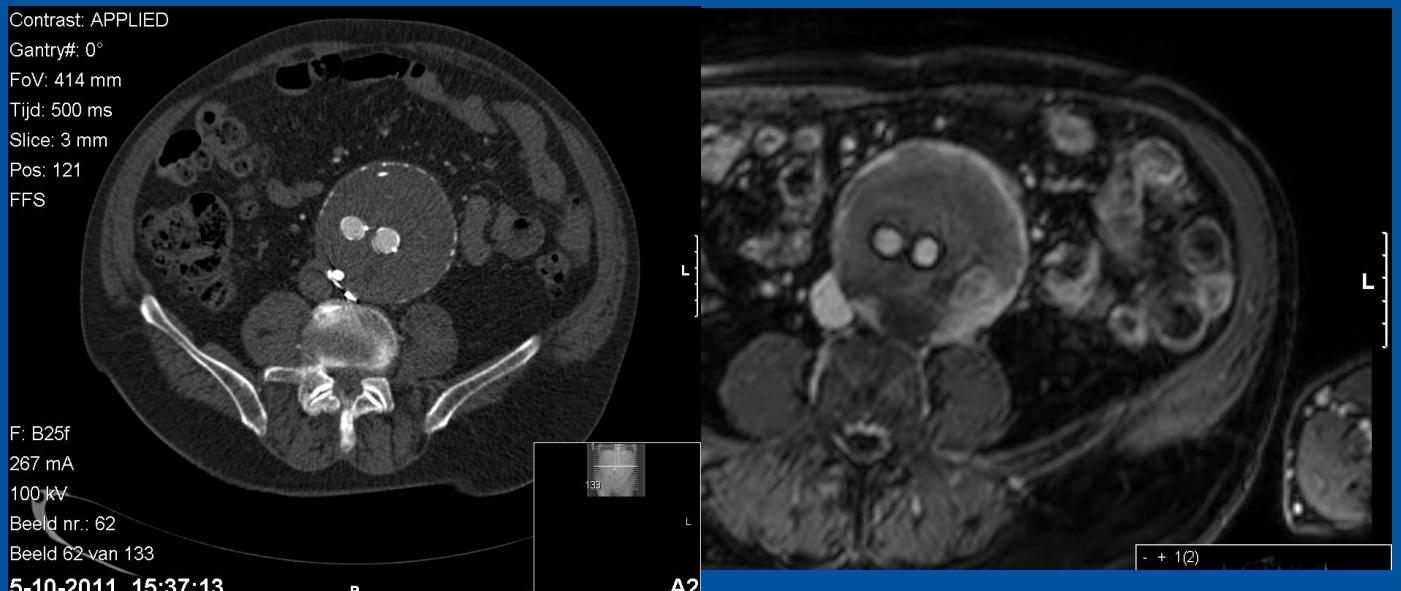
- No harmfull radiation
- High Sensitivity & Specificity in EL detection
- Better identification of Type II endoleaks
- Stentgrafts (and pts) need to be MRI-compatible
  - Nitinol
  - Stainless steel



Follow-up needed AFTER EVAR!!!

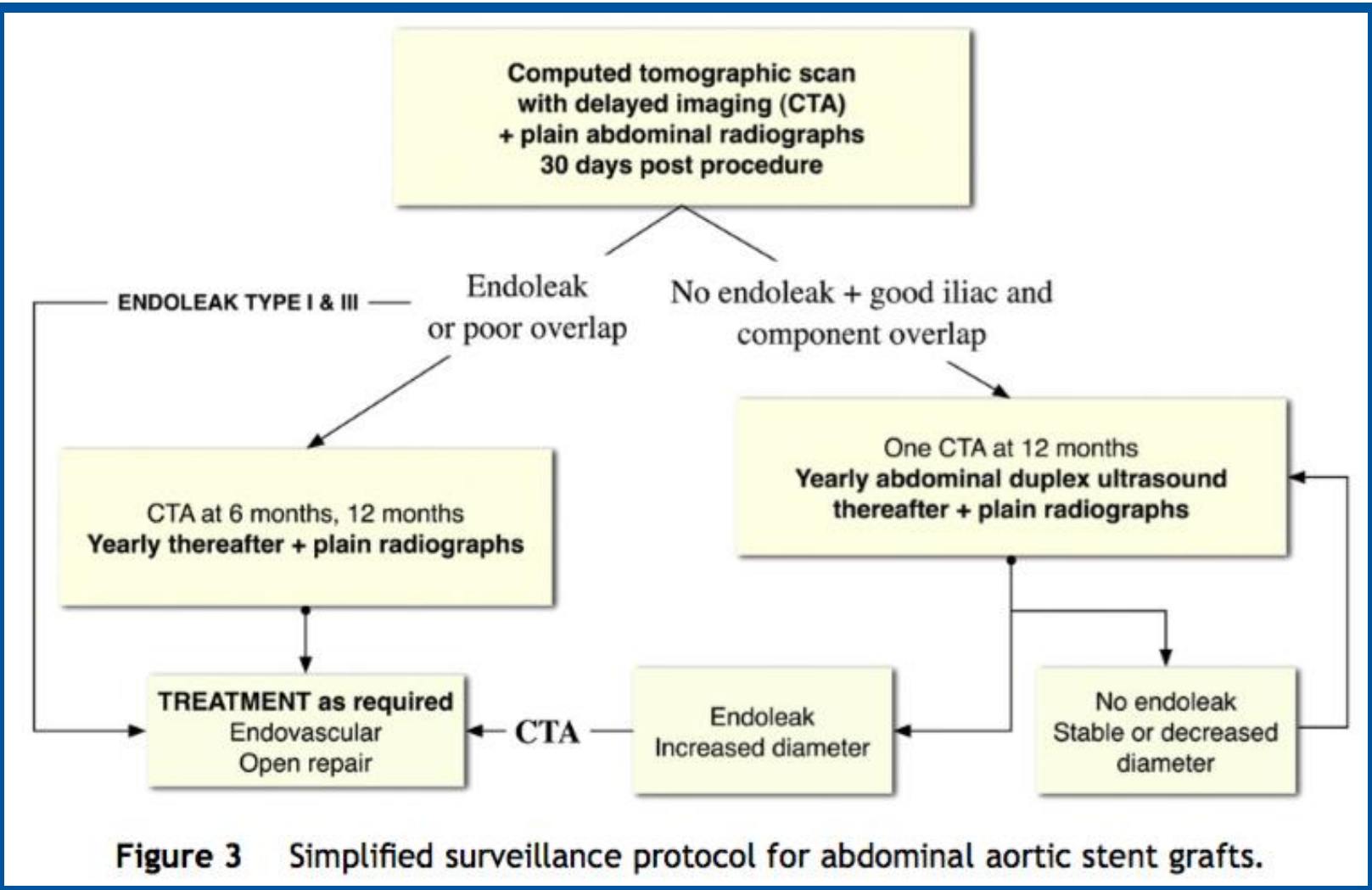


Figure 3 Simplified surveillance protocol for abdominal aortic stent grafts.

ESVS guidelines 2013

Follow-up needed AFTER EVAR!!!

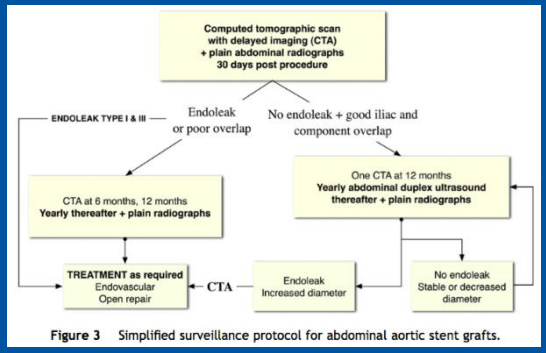


Figure 3 Simplified surveillance protocol for abdominal aortic stent grafts.

- With classic non-individualized schedules many patients get unnecessary follow-up due to better stentgrafts, improved EVAR procedures & changed indications for re-interventions

Eur J Vasc Endovasc Surg (2010) 39, 547–554

ELSEVIER

REVIEW

Secondary Interventions Following Endovascular Aneurysm Repair (EVAR) and the Enduring Value of Graft Surveillance

I.M. Nordon*, A. Karthikesalingam, R.J. Hinchliffe, P.J. Holt, I.M. Loftus, M.M. Thompson

REVIEW

Secondary Interventions Following Endovascular Aneurysm Repair (EVAR) and the Enduring Value of Graft Surveillance

I.M. Nordon*, A. Karthikesalingam, R.J. Hinchliffe, P.J. Holt, I.M. Loftus, M.M. Thompson

- 32 Papers, 17.987 EVAR cases.
- Annual secondary intervention rates from the US population registries were 3.7%/year (range 1.7-4.3%).
- Most ruptures in first 2-3 yrs after EVAR
- Mean time to secondary interventions 1-1½ years.
- Proposal: if a patient completes 3 years of surveillance without detection of endoleak or sac enlargement, the patient can be discharged from follow-up.

Secondary Interventions Following Endovascular Aneurysm Repair (EVAR) and the Enduring Value of Graft Surveillance

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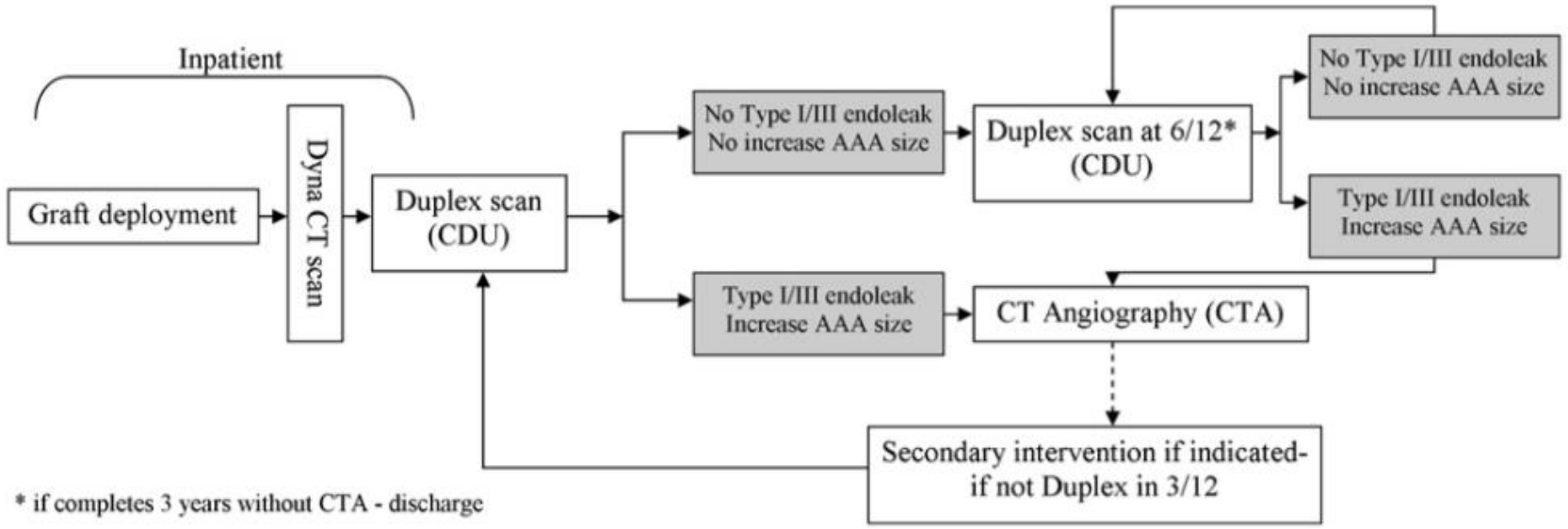

Figure 3 Proposed surveillance program.

Adequate seal and no endoleak on the first postoperative computed tomography angiography as criteria for no additional imaging up to 5 years after endovascular aneurysm repair

ntrum

Frederico Bastos Gonçalves, MD,[a,b] Koen M. van de Luijtgaarden, MD,[a] Sanne E. Hoeks, PhD,[a] Johanna M. Hendriks, MD, PhD,[a] Sander ten Raa, MD, PhD,[a] Ellen V. Rouwet, MD, PhD,[a] Robert J. Stolker, MD, PhD,[c] and Hence J. M. Verhagen, MD, PhD,[a] *Rotterdam, The Netherlands; and Lisbon, Portugal*

(J Vasc Surg 2013;57:1503-11.)

- Evaluated the predictive value of the first postoperative CTA for aneurysm-related adverse events as a means of patient selection for risk-adapted surveillance

Adequate seal and no endoleak on the first postoperative computed tomography angiography as criteria for no additional imaging up to 5 years after endovascular aneurysm repair

(J Vasc Surg 2013;57:1503-11.)

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131 patients with med FU 4.1 yrs

N= 62 Low Risk
(>10mm sealing / no endoleak)

N= 69 High Risk
(<10mm sealing / endoleak)

Adequate seal and no endoleak on the first postoperative computed tomography angiography as criteria for no additional imaging up to 5 years after endovascular aneurysm repair

(J Vasc Surg 2013;57:1503-11.)

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	Low Risk (n=62)	High Risk (n=69)
Sac growth	2	15
Secondary interventions (number of patients)	3	23
5-yrs freedom from aneurysm related evevnts	98%	52%
Number of image examinations needed for 1 adverse event	82	8

Adequate seal and no endoleak on the first postoperative computed tomography angiography as criteria for no additional imaging up to 5 years after endovascular aneurysm repair

(J Vasc Surg 2013;57:1503-11.)

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Conclusions

- Roughly half of patients were considered low risk, and imaging surveillance up to 5 years could have been waived (follow-up like “open repair”)

- But, in patients at higher risk of complications close surveillance is needed

Adequate seal and no endoleak on the first postoperative computed tomography angiography as criteria for no additional imaging up to 5 years after endovascular aneurysm repair

(J Vasc Surg 2013;57:1503-11.)

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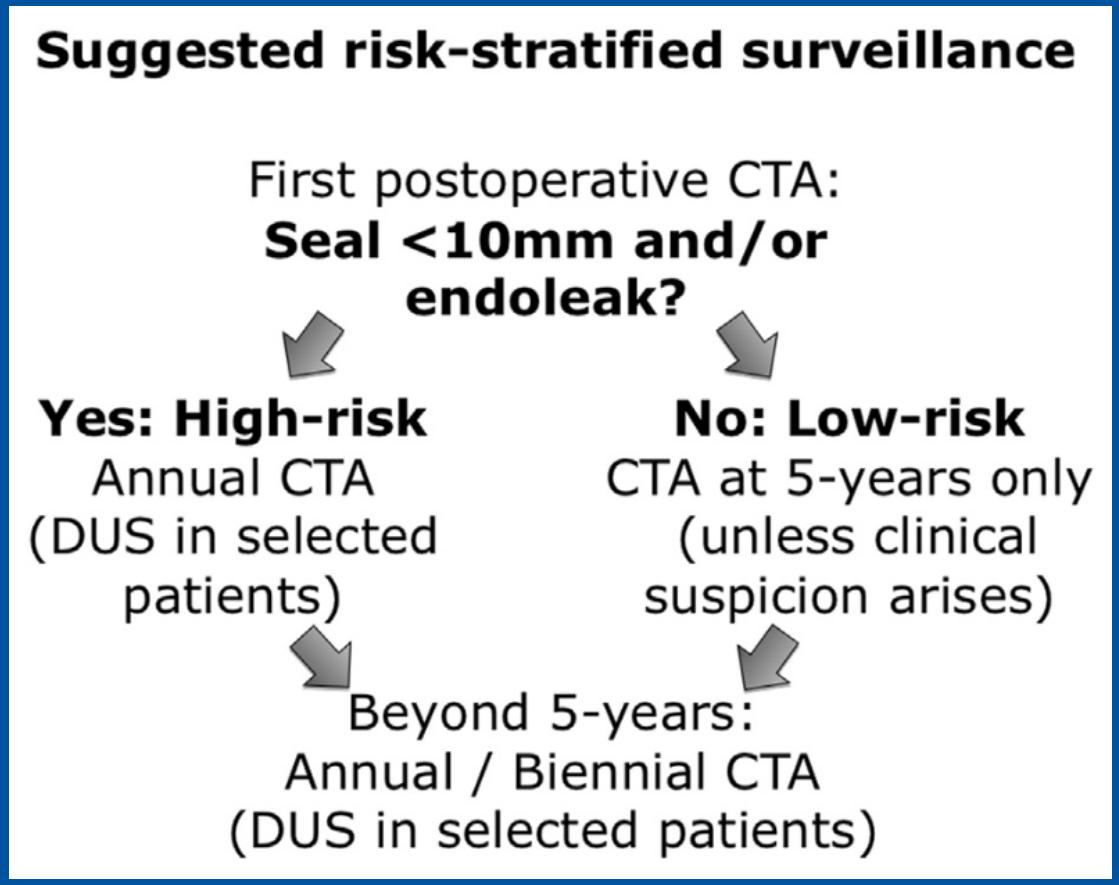

A limited and customized follow-up seems justified after endovascular abdominal aneurysm repair in octogenarians

Linda Visser, MD, Robert A. Pol, MD, PhD, Ignace F. J. Tielliu, MD, PhD, Jan J. A. M. van den Dungen, MD, PhD, and **Clark J. Zeebregts, MD, PhD,** *Groningen, The Netherlands*

(J Vasc Surg 2014;59:1232-40.)

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(J Vasc Surg 2014;59:1232-40.)

- Database EVAR 1996 - 2011
- Pts >80yrs with non-RAAA EVAR included (SG, N=97))

- CONTROL GROUP (CG): non-RAAA Pts, < 80Yrs, matched on Gender & AAA diameter (N=96)

- Median follow-up 34 months

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	> 80 (n=97)	< 80 (n=96)	*P*
SG related compl	41%	40%	.82
5-yrs survival	32%	66%	<0.05
Secondary interventions	8.2%	19.8%	.02
Med Time to SI	*11 months*	*54 months*	
RAAA	*N=0*	*N=1*	

A limited and customized follow-up seems justified after endovascular abdominal aneurysm repair in octogenarians

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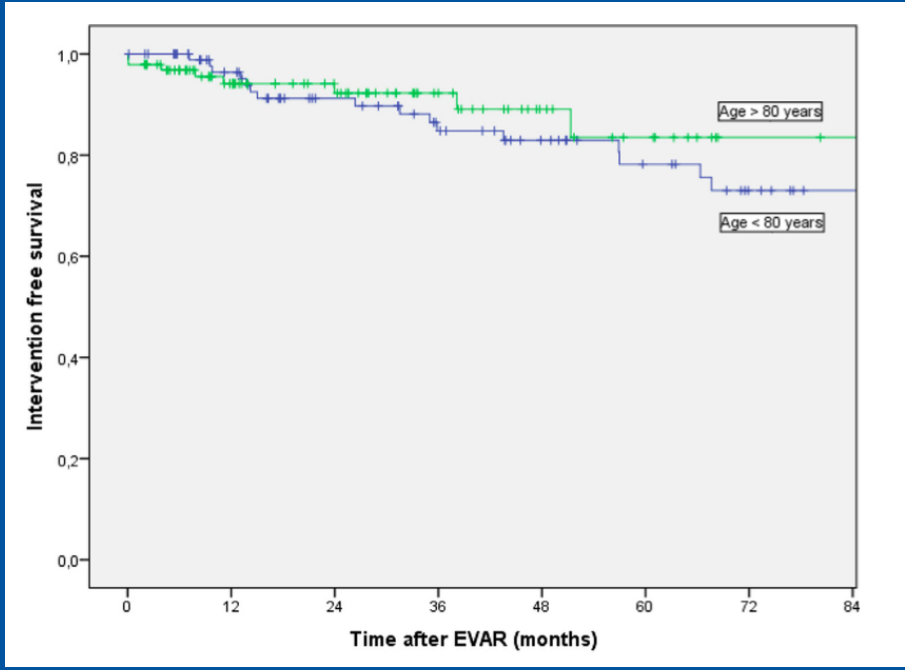

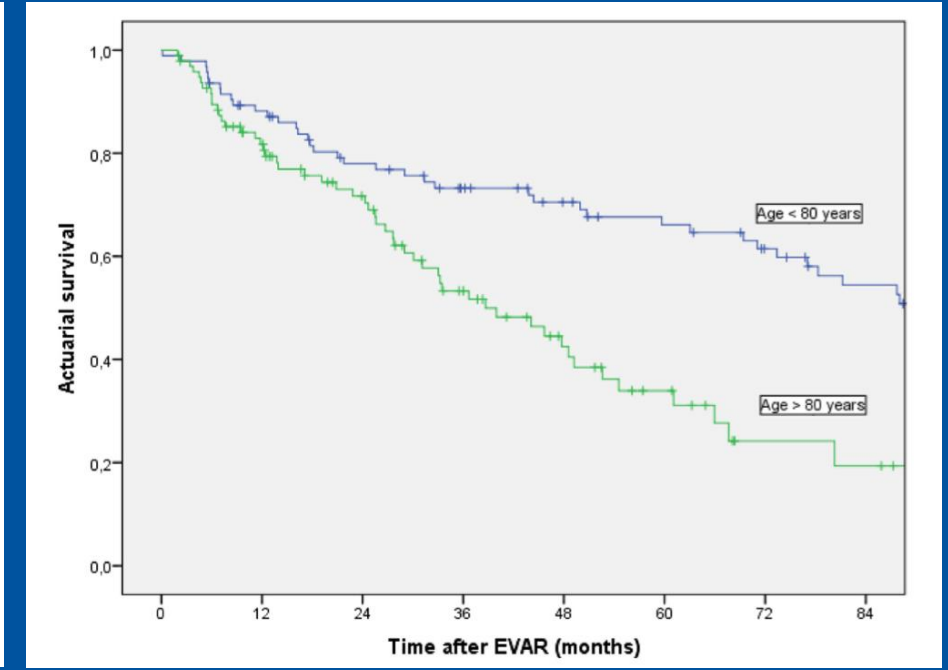

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(J Vasc Surg 2014;59:1232-40.)

CONCLUSIONS

- Incidence of interventions and AAA- related death was lower in octogenarians.
- An adapted and shortened follow-up seems warranted in octogenarians after EVAR.
- A shortened follow-up will most likely have no effect on patient survival but may lower the total amount of EVAR costs and increase quality of life.

- Lifelong follow-up is probably necessary. But, It's obvious that we plan to many follow-up visits, including to many image examinations
- Low-risk patients (on post-op CTA) probably don't need FU for the first 3 yrs
- Skip 50% of Follow-up visits in fragile patients
- Time for consensus about reduced FU-schedules !!
- New, adapted FU-schedules should be included in upcoming guidelines