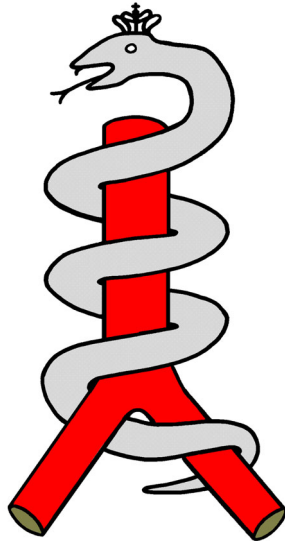


# **The Danish Vascular Registry**

## **Landsregistret Karbase**

[www.karbase.dk](http://www.karbase.dk)



**Annual report 2001**

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*Annual report 2001*

*from The Danish Vascular Registry (Karbasse)*

## Introduction

This is the report from *The Danish Vascular Registry* for the year 2001. The content is mainly statistical figures and tables with only few remarks and explanations. The registry is transforming from an old technological platform to a new internet-based in 2002-3. One of the consequences is, that our aim of publishing data in two versions, one for the vascular specialist and one for the public, has not been feasible this year. In the coming years reporting will evolve to be more “on-line” and with new methods of analysis and presentations.

In Denmark year 2001, vascular services were confined to eleven highly specialised departments. One of the departments, Esbjerg, ceased to exist as an independent unit at the end of the year, but is still presented independently in this report. The report covers nearly all vascular surgery in Denmark, since it is confined to the vascular units alone.

The Registry was introduced in 1989 at the University Hospital of Copenhagen, Rigshospitalet, and over the next years accepted by the other vascular departments, giving full coverage of the country in 1993. In the years 1993 – 95 it was agreed to publish the first reports with data on the number of vascular procedures and frequency of surgical infections. In 1996, it was agreed to establish a national registry with electronic reporting of all data except the surgeon identification. This is the sixth report since then, all available as adobe documents at [www.karbase.dk](http://www.karbase.dk).

The essential event in the registry is the *primary operation*, defined as an operation with independent significance and follow-up. More than one operation under the same admission, and even same anaesthesia, can be of independent significance, thus leading to its own course and follow-up in the database. Each *primary operation* can in turn have a number of attached *supplementary operations* without independent significance (e.g. reoperation for bleeding), and one patient can have more than one admission during the year. Thus, In 2001 the registry contains information on

**5466** patients with  
    **6326** admissions (+ 16%), undertaken  
    **6586** Anaesthesias (+ 4%)  
    **7699** Operations (+ 17%)  
        **6886** primary operations and           (89%)  
        **813** supplementary operations       (11%)

A huge effort has been made locally to secure the validity of the presented data. A more comprehensive validation of the registry is still awaiting publication for the 1998 data.

Hopefully, the information presented in this report will be useful in the continuing discussion among colleagues in vascular surgery, as means to secure and improve a high level of quality in the busy daily clinical life. To further aid this process each department will receive its own local copy of the report, with information of own results to compare with the national data. However, others may find the report interesting as well, despite the rather few comments in this version.

The representatives from the 11 departments have adopted the report in its present form.

Copenhagen, October 2002

Leif Panduro Jensen ([lpj@dadlnet.dk](mailto:lpj@dadlnet.dk))  
Chairman of The Danish Vascular Registry

## The Danish Vascular Registry

### All primary vascular procedures in Denmark 1996 – 2001

Procedure	All	1996	1997	1998	1999	2000	2001
<b>TEA a. carotis</b>	<b>1111</b>	175	162	181	190	209	194
<b>Other supraaortic operation</b>	<b>150</b>	33	28	17	18	26	28
<b>Visceral operation</b>	<b>194</b>	55	36	25	28	22	28
Renal	77	30	10	10	9	6	12
Mesenteric	117	25	26	15	19	16	16
<b>Aorto/iliac-femoral bypass</b>	<b>2241</b>	420	406	402	356	319	338
Open surgery	2212	420	399	398	354	315	326
Endovascular	29	0	7	4	2	4	12
<b>Abdominal Aortic Aneurysm</b>	<b>3849</b>	670	693	674	612	586	614
Open surgery	3794	668	684	662	605	572	603
Ruptured	1414	218	259	264	232	209	232
Acute	706	163	124	129	105	91	94
Elective	1513	262	275	241	240	242	253
Other (fibrosis etc.)	161	25	26	28	28	30	24
Endovascular	55	2	9	12	7	14	11
<b>Other aneurysms</b>	<b>1143</b>	186	208	199	213	183	154
<b>Aorto-iliac TEA</b>	<b>587</b>	119	124	89	96	83	76
<b>Other TEA</b>	<b>803</b>	112	120	149	135	141	146
<b>Fem-fem cross-over bypass</b>	<b>1360</b>	202	227	247	227	230	227
<b>Fem-pop bypass AK</b>	<b>1855</b>	401	389	335	268	219	243
Prosthesis	1648	339	331	299	251	208	220
In situ	184	56	54	33	14	9	18
Other	23	6	4	3	3	2	5
<b>Fem-pop bypass BK</b>	<b>1847</b>	368	315	305	308	301	250
Prosthesis	352	73	49	54	66	59	51
In situ	1342	265	222	223	219	230	183
Other	153	30	44	28	23	12	16
<b>Fem-crural bypass</b>	<b>2734</b>	561	419	422	472	447	413
Prosthesis	223	27	23	39	56	43	35
In situ	2114	419	326	329	346	358	336
Other	397	115	70	54	70	46	42
<b>Other arterial bypass</b>	<b>507</b>	122	94	63	68	65	95
<b>Embolectomy/Thrombectomy</b>	<b>2583</b>	480	443	433	418	408	401
Bypass	674	120	132	123	94	111	94
Arteries	1909	360	311	310	324	297	307
<b>Arterial thrombolysis</b>	<b>882</b>	13	151	188	179	196	155
<b>PTA</b>	<b>5919</b>	728	947	976	1024	1124	1120
Aorto-iliac	3673	430	579	649	641	693	681
Femoro-crural	1380	226	242	182	233	249	248
Bypass	490	51	86	99	73	95	86
Other	376	21	40	46	77	87	105
<b>Venous procedures</b>	<b>4377</b>	332	568	641	700	894	1242
Varicose veins	4122	290	507	602	676	866	1181
Thrombolysis / thrombectomy	132	33	37	22	9	11	20
Other	117	9	24	17	15	16	36
<b>Reoperations</b>	<b>1074</b>	185	178	169	176	171	195
<b>Other arterial operations</b>	<b>3388</b>	472	550	495	540	702	629
<b>Other operations</b>	<b>1594</b>	169	268	270	262	282	343
<b>All</b>	<b>38192</b>	<b>5803</b>	<b>6326</b>	<b>6280</b>	<b>6290</b>	<b>6607</b>	<b>6886</b>

*NOTE! Reoperations / supplementary operations under the same admission are **not** included.  
Only a minor fraction of operations for varicose veins are done at vascular departments*

## Primary procedures, 11 departments, 2001

*NOTE! Reoperations / Supplementary operations under the same admission are **not** included*

Procedure	All	Department										
		Rigshospitalet	Gentofte	Hillerød	Slagelse	Odense	Aabenraa	Kolding	Esbjerg	Skejby	Viborg	Aalborg
<b>TEA a. carotis</b>	<b>194</b>	69	0	0	0	50	0	0	0	22	16	37
<b>Other supraaortic operation</b>	<b>28</b>	1	1	0	1	7	0	0	0	7	4	7
<b>Visceral operation</b>	<b>28</b>	6	5	1	0	3	0	0	1	2	1	9
Renal	12	0	1	0	0	0	0	0	0	2	0	9
Mesenteric	16	6	4	1	0	3	0	0	1	0	1	0
<b>Aorto/iliac-femoral bypass</b>	<b>338</b>	19	31	9	29	70	0	23	15	39	46	57
Open surgery	326	17	28	9	29	67	0	23	13	37	46	57
Endovascular	12	2	3	0	0	3	0	0	2	2	0	0
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	84	68	35	62	106	0	53	18	60	72	56
Open surgery	603	82	68	35	62	97	0	53	18	60	72	56
Ruptured	232	38	26	12	25	42	0	18	7	24	20	20
Acute	94	11	17	4	6	19	0	5	2	12	11	7
Elective	253	31	23	18	29	32	0	28	9	18	39	26
Other (fibrosis etc.)	24	2	2	1	2	4	0	2	0	6	2	3
Endovascular	11	2	0	0	0	9	0	0	0	0	0	0
<b>Other aneurysms</b>	<b>153</b>	19	12	15	9	23	0	18	3	21	14	19
<b>Aorto-Iliac TEA</b>	<b>76</b>	9	17	4	16	5	0	6	0	8	6	5
<b>Other TEA</b>	<b>146</b>	17	26	7	22	10	2	11	6	16	7	22
<b>Fem-fem cross-over bypass</b>	<b>227</b>	25	21	15	37	33	13	22	8	20	14	19
<b>Fem-pop bypass AK</b>	<b>243</b>	16	6	6	25	46	22	25	20	33	21	23
Prosthesis	220	13	6	4	25	41	22	21	20	30	17	21
In situ	18	2	0	2	0	5	0	4	0	2	1	2
Other	5	1	0	0	0	0	0	0	0	1	3	0
<b>Fem-pop bypass BK</b>	<b>250</b>	34	57	7	28	37	5	21	5	14	23	19
Prosthesis	51	10	13	2	11	5	1	2	1	4	0	2
In situ	183	22	40	5	13	29	4	17	4	10	23	16
Other	16	2	4	0	4	3	0	2	0	0	0	1
<b>Fem-crural bypass</b>	<b>413</b>	33	62	37	24	55	1	46	14	39	43	59
Prosthesis	35	0	12	2	0	3	0	4	2	10	2	0
In situ	336	33	43	31	22	45	1	40	9	22	40	50
Other	42	0	7	4	2	7	0	2	3	7	1	9
<b>Other arterial bypass</b>	<b>95</b>	5	6	13	7	20	1	0	1	8	13	21
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	29	65	14	48	62	1	47	6	34	31	64
Bypass	94	1	11	3	3	10	1	23	2	6	9	25
Arteries	307	28	54	11	45	52	0	24	4	28	22	39
<b>Arterial thrombolysis</b>	<b>155</b>	85	18	10	4	5	0	0	1	11	12	9
<b>PTA</b>	<b>1115</b>	252	201	40	139	114	37	92	48	70	71	51
Aorto-Iliac	681	122	119	23	81	96	30	65	15	44	53	33
Femoro-crural	243	95	44	11	5	10	6	10	32	15	9	6
Bypass	86	19	25	1	3	5	0	16	1	5	7	4
Other	105	16	13	5	50	3	1	1	0	6	2	8
<b>Venous procedures</b>	<b>1242</b>	101	274	137	26	3	0	115	110	22	132	322
Varicose veins	1181	98	245	132	26	1	0	114	108	21	119	317
Thrombolysis / thrombectomy	20	2	17	0	0	1	0	0	0	0	0	0
Other	41	1	12	5	0	1	0	1	2	1	13	5
<b>Reoperations</b>	<b>195</b>	25	26	13	8	51	3	13	8	18	9	21
<b>Other arterial operations</b>	<b>630</b>	20	55	43	22	43	34	110	35	52	65	151
<b>Other operations</b>	<b>343</b>	69	27	49	9	27	0	6	34	26	72	24
<b>All</b>	<b>6886</b>	<b>918</b>	<b>978</b>	<b>455</b>	<b>516</b>	<b>770</b>	<b>119</b>	<b>608</b>	<b>333</b>	<b>522</b>	<b>672</b>	<b>995</b>

## Other operations

NCSP-code*	Explanation	No.
PBL30	A-v fistula from radial or ulnar artery	189
TPH20	Central venous catheder	104
PBL20	A-v fistula from the brachial artery	86
QDA10	Skin incision on the lower extremity	61
TPW99	Other small operation on artery, vein or lymphatic	37
PEN11	Profundaplasty	30
PBU82	Revision of a-v fistula on the upper extremity	26
PFA10	Exploration of the popliteal or crural arteries	24
PEC10	Suture of the common femoral artery	20
PEU81	Ligature of fistula after bypass from femoral artery	20
NHQ16	Toe amputation	17
PFU81	Ligature of fistula after fem-pop bypass	17
PEU82	Revision of bypass from the femoral artery	16
PEA10	Exploration of the common femoral artery	15
PEL10	A-v fistula from femoral artery to femoral vein	13
PFW99	Other operation on distal popliteal artery	13
KAC00	Nephrectomy	12
NHQ14	Transmetatarsal amputation	12
GAE40	Operation for Thoracic Outlet Syndrome	11
PDU88	Excision of bypass from aorta or iliac artery	11
PEU99	Other operation after reconstruction of fem./popl. artery	11

\* NCSP = *Nordic Classification of Surgical Procedures. NOMESCO 1995, ISBN 87-16-11220-2, Internet: www.nom-nos.dk*

The groups *other arterial operations* and *other operations* in the table with [Primary operations](#) above is presented in detail here for codes with more than 10 occurrences.

## Endovascular prostheses

NCSP-code*	Explanation	No.
PAQ30	Endoprosthesis in Subclavian artery	1
PAQ99	Endoprosthesis in Thoracic branch	1
PCQ40	Endoprosthesis in Renal artery	2
PDQ10	Endoprosthesis in infrarenal aorta	13
PDQ30	Endoprosthesis in iliac artery	12
PEQ10	Endoprosthesis in Common femoral artery	1
PFQ10	Endoprosthesis in Popliteal artery	2

\* NCSP = *Nordic Classification of Surgical Procedures. NOMESCO 1995, ISBN 87-16-11220-2*

This table offers detailed information on the use of endoprotheses in Denmark. The use of endoprotheses is still rare, and confined to few centres.

## Percutaneous Transluminal Angioplasty (PTA)

### *Primary interventions*

NCSP-code*	Explanation	No.	% with stent
PAP10	PTA of the brachiocephalic trunc	1	100
PAP30	PTA of the subclavian artery	8	63
PAP99	PTA of other branch from thoracic aorta	1	0
PBP10	PTA of the axillary artery	1	0
PBP20	PTA of the brachial artery	1	0
PBP99	PTA of other branch upper limb	1	0
PBU83	PTA of a-v fistula on the upper extremity	6	17
PCP30	PTA of the superior mesenteric artery	4	50
PCP40	PTA of the renal artery	31	61
PCP99	PTA of other visceral artery	2	50
PDP10	PTA of the infrarenal aorta	13	46
PDP30	PTA of the iliac artery	675	66
PDP50	PTA of the infrarenal aorta/iliac with stent	55	100
PDU83	PTA of bypass from infrarenal aorta/iliac artery	8	38
PEP10	PTA of the common femoral artery	34	21
PEP11	PTA of the deep femoral artery	3	0
PEP12	PTA of the superficial femoral artery	171	12
PEU83	PTA of bypass to the femoral or popliteal artery	53	8
PFP10	PTA of the popliteal artery	34	9
PFP30	PTA of crural or pedal artery	21	10
PFU83	PTA of bypass to crural or pedal artery	33	0
PHP23	PTA of the iliac vein	3	100
PHP30	PTA of infrarenal caval vein	1	0
PHP99	PTA of other vein	2	50

\* NCSP = *Nordic Classification of Surgical Procedures. NOMESCO 1995, ISBN 87-16-11220-2*

### Supplementary operations

NCSP-code*	Explanation	No.
PWE00	Reop. for bleeding after vascular operation	103
PWW99	Other reop. after vascular operation	44
PEU81	Ligature of fistula after bypass from femoral artery	39
PFU81	Ligature of fistula after fem-pop bypass	38
PWH00	Reop. for seroma after vascular operation	37
PWC00	Reop. for infection after vascular operation	27
NHQ14	Transmetatarsal amputation	26
PFU74	Thrombectomy of bypass from femoral or popliteal artery	26
PWD00	Reop. for superficial bleeding after vascular operation	26
JAH00	Explorative laparotomy	20
QDG20	Operation for chronic ulcer on the leg	20
PEU74	Thrombectomy of femoro-popliteal bypass	19
PWA00	Suture of wound dehiscence after vascular operation	19
JWA00	Suture of wound dehiscence after gastroenteric operation	18
QDB00	Suture of skin of lower extremity	18
NHQ17	Partial amputation of toe	17
PEU82	Revision of bypass from the femoral artery	16
NHQ16	Toe amputation	15
NGM19	Fasciectomy partialis/totalis, knee and calf	13
PEE10	Thrombectomy/embolektomy of common femoral artery	13
PWB00	Reop. for superficial surgical wound infection after vascular surgery	11

The term "Supplementary operations" covers operations performed in addition to a primary operation, without independent significance, and thus without a need for independent follow-up or evaluation of outcome.

## Procedure and degree of ischaemia

Procedure	No.	All ischaemic indications		Acute ischaemia		Intermittent Claudication		Ischaemic rest pain		Ischaemic tissue loss	
		No.	%	No.	%	No.	%	No.	%	No.	%
<b>Aorto/iliac-femoral bypass</b>	<b>336</b>	313	93	20	6	177	57	62	20	54	17
Open surgery	326	306	94	20	7	171	56	61	20	54	18
Endovascular	12	7	58	0		6	86	1	14	0	
<b>Aorto-iliac TEA</b>	<b>76</b>	68	89	3	4	40	59	14	21	11	16
<b>Other TEA</b>	<b>146</b>	140	96	10	7	73	52	30	21	27	19
<b>Fem-fem cross-over bypass</b>	<b>227</b>	221	97	31	14	84	38	61	28	45	20
<b>Fem-pop bypass AK</b>	<b>243</b>	240	99	14	6	105	44	36	15	85	35
Prosthesis	220	219	100	13	6	97	44	31	14	78	36
In situ	18	17	94	1	6	5	29	5	29	6	35
Other	5	4	80	0		3	75	0		1	25
<b>Fem-pop bypass BK</b>	<b>250</b>	246	98	11	4	37	15	76	31	122	50
Prosthesis	51	50	98	2	4	2	4	18	36	28	56
In situ	183	180	98	9	5	32	18	52	29	87	48
Other	16	16	100	0		3	19	6	38	7	44
<b>Fem-crural bypass</b>	<b>413</b>	399	97	22	6	19	5	103	26	255	64
Prosthesis	35	31	89	2	6	0		15	48	14	45
In situ	336	331	99	17	5	16	5	81	24	217	66
Other	42	37	88	3	8	3	8	7	19	24	65
<b>Other arterial bypass</b>	<b>95</b>	75	79	19	25	12	16	18	24	26	35
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	354	88	337	95	4	1	7	2	6	2
Bypass	94	57	61	49	86	3	5	2	4	3	5
Arteries	307	297	97	288	97	1	0	5	2	3	1
<b>Arterial thrombolysis</b>	<b>155</b>	135	87	104	77	12	9	18	13	1	1
<b>PTA</b>	<b>1115</b>	961	86	31	3	564	59	150	16	216	22
Aorto-iliac	681	653	96	15	2	434	66	89	14	115	18
Femoro-crural	243	226	93	8	4	86	38	48	21	84	37
Bypass	86	21	24	2	10	7	33	3	14	9	43
Other	105	61	58	6	10	37	61	10	16	8	13
<b>Other arterial operations</b>	<b>630</b>	127	20	40	31	25	20	27	21	35	28
<b>All</b>	<b>6886</b>	<b>3369</b>	<b>49</b>	<b>667</b>	<b>20</b>	<b>1174</b>	<b>35</b>	<b>614</b>	<b>18</b>	<b>914</b>	<b>27</b>

The percentage of “all ischaemic indications” relates to the total number of operations performed, also for non-ischaemic indications (e.g. graft salvage, trauma etc.). The percentage of the other columns relates to “all ischaemic indications”.

### Vascular core-operations

*vascular core-operations* are considered the primary operations performed on the vascular departments, regardless of local traditions, as defined below:

#### Definition of Vascular Core-operations:

- ❖ All arterial and venous reconstructions, including:
  - Open surgery, endovascular procedures and endoprotheses
  - Embolectomy and thrombectomy
  - Thrombolysis
- ❖ Sympathectomy
- ❖ Operation for Thoracic Outlet Syndrome

#### Not included:

- ❖ Revision / thrombectomy of reconstructions within 30 days
- ❖ Varicose Veins
- ❖ Angioaccess for haemodialysis, or revision of these
- ❖ Minor reoperations (bleeding etc.), coded by NCSP-codes PWxyy
- ❖ Amputations
- ❖ Biopsies, e.g. the temporal artery



## Vascular core-operations 2001

*4767 core-operations corresponds to 87 procedures per 100,000 inhabitants*

Procedure	All	Rigshospitalet	Gentofte	Hillerød	Slagelse	Odense	Aabenraa	Kolding	Esbjerg	Skejby	Viborg	Aalborg
<b>TEA a. carotis</b>	<b>194</b>	69	0	0	0	50	0	0	0	22	16	37
<b>Other supraaortic operation</b>	<b>28</b>	1	1	0	1	7	0	0	0	7	4	7
<b>Visceral operation</b>	<b>28</b>	6	5	1	0	3	0	0	1	2	1	9
Renal	12	0	1	0	0	0	0	0	0	2	0	9
Mesenteric	16	6	4	1	0	3	0	0	1	0	1	0
<b>Aorto/iliac-femoral bypass</b>	<b>334</b>	17	31	9	28	70	0	23	15	38	46	57
Open surgery	322	15	28	9	28	67	0	23	13	36	46	57
Endovascular	12	2	3	0	0	3	0	0	2	2	0	0
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	84	68	35	62	106	0	53	18	60	72	56
Open surgery	603	82	68	35	62	97	0	53	18	60	72	56
Ruptured	232	38	26	12	25	42	0	18	7	24	20	20
Acute	94	11	17	4	6	19	0	5	2	12	11	7
Elective	253	31	23	18	29	32	0	28	9	18	39	26
Other (fibrosis etc.)	24	2	2	1	2	4	0	2	0	6	2	3
Endovascular	11	2	0	0	0	9	0	0	0	0	0	0
<b>Other aneurysms</b>	<b>152</b>	19	11	15	9	23	0	18	3	21	14	19
<b>Aorto-iliac TEA</b>	<b>76</b>	9	17	4	16	5	0	6	0	8	6	5
<b>Other TEA</b>	<b>146</b>	17	26	7	22	10	2	11	6	16	7	22
<b>Fem-fem cross-over bypass</b>	<b>227</b>	25	21	15	37	33	13	22	8	20	14	19
<b>Fem-pop bypass AK</b>	<b>243</b>	16	6	6	25	46	22	25	20	33	21	23
Prosthesis	220	13	6	4	25	41	22	21	20	30	17	21
In situ	18	2	0	2	0	5	0	4	0	2	1	2
Other	5	1	0	0	0	0	0	0	0	1	3	0
<b>Fem-pop bypass BK</b>	<b>249</b>	33	57	7	28	37	5	21	5	14	23	19
Prosthesis	51	10	13	2	11	5	1	2	1	4	0	2
In situ	182	21	40	5	13	29	4	17	4	10	23	16
Other	16	2	4	0	4	3	0	2	0	0	0	1
<b>Fem-crural bypass</b>	<b>412</b>	33	62	37	24	54	1	46	14	39	43	59
Prosthesis	35	0	12	2	0	3	0	4	2	10	2	0
In situ	335	33	43	31	22	44	1	40	9	22	40	50
Other	42	0	7	4	2	7	0	2	3	7	1	9
<b>Other arterial bypass</b>	<b>94</b>	5	6	13	7	19	1	0	1	8	13	21
<b>Embolectomy/Thrombectomy</b>	<b>375</b>	29	63	13	47	61	0	33	6	34	31	58
Bypass	72	1	11	2	2	10	0	9	2	6	9	20
Arteries	303	28	52	11	45	51	0	24	4	28	22	38
<b>Arterial thrombolysis</b>	<b>154</b>	84	18	10	4	5	0	0	1	11	12	9
<b>PTA</b>	<b>1109</b>	252	200	40	139	113	37	89	48	70	70	51
Aorto-iliac	681	122	119	23	81	96	30	65	15	44	53	33
Femoro-crural	243	95	44	11	5	10	6	10	32	15	9	6
Bypass	80	19	24	1	3	4	0	13	1	5	6	4
Other	105	16	13	5	50	3	1	1	0	6	2	8
<b>Venous procedures</b>	<b>61</b>	3	29	5	0	2	0	1	2	1	13	5
Varicose veins	0	0	0	0	0	0	0	0	0	0	0	0
Thrombolysis / thrombectomy	20	2	17	0	0	1	0	0	0	0	0	0
Other	41	1	12	5	0	1	0	1	2	1	13	5
<b>Reoperations</b>	<b>0</b>	0	0	0	0	0	0	0	0	0	0	0
<b>Other arterial operations</b>	<b>261</b>	19	43	7	18	21	1	29	10	47	26	40
<b>Other operations</b>	<b>11</b>	1	2	0	0	5	0	0	0	0	1	2
<b>All</b>	<b>4768</b>	<b>722</b>	<b>666</b>	<b>224</b>	<b>467</b>	<b>670</b>	<b>82</b>	<b>377</b>	<b>158</b>	<b>451</b>	<b>433</b>	<b>518</b>

## Eurovasc

In 1996 it was decided in the European Board of Vascular Surgery, Union Européenne des Médecins Spécialistes (UEMS), to establish a common European reporting of vascular procedures, the EUROVASC. The aim was to get existing vascular registries to report comparable data, and to stimulate the creation of vascular registries in the countries where they still did not exist. This initiative was followed by the VASCUNET collaboration of existing vascular registries in 1997. Since 1997, several registries have reported EUROVASC data, now available on the Internet (<http://www.esvs.org/international/vascunet.htm>). The Danish Vascular Registry (Karbasc) has participated in this collaboration from the beginning.

EUROVASC 2001 Procedure	All	Per 100.000	Rigshospitalet										
			Gentofte	Hillerød	Slagelse	Odense	Aabenraa	Kolding	Esbjerg	Århus	Viborg	Aalborg	
A. Open surg. on Carotid art.	194	3,6	69	0	0	0	50	0	0	0	22	16	37
B. Open surg. for AAA	603	11,1	82	68	35	62	97	0	53	18	60	72	56
C. Open surg. for COAD	625	11,5	50	66	28	82	104	13	51	21	64	66	80
D. Open surg. for POAD AK	451	8,3	35	52	14	50	64	24	42	29	56	30	55
E. Open surg. for POAD BK	668	12,3	67	121	45	52	92	7	67	19	53	67	78
F. PTA central	684	12,6	125	119	23	81	96	30	65	15	44	53	33
G. PTA peripheral	320	5,9	111	68	12	8	14	6	23	33	20	15	10
H. Endoprosthesis for AAA	11	0,2	2	0	0	0	9	0	0	0	0	0	0
I. Endoprosthesis for COAD	14	0,3	2	4	0	0	3	0	0	2	2	0	1
J. Endoprosthesis for POAD	3	0,1	2	0	0	0	0	0	0	0	1	0	0
K. Arterial trauma	30	0,6	5	4	1	2	1	0	3	0	2	6	6
L. Angioaccess	288	5,3	0	0	34	0	13	29	67	16	0	34	95

### Explanations and comments:

AAA = Abdominal Aortic Aneurysm

COAD = Central Occlusive Arterial Disease

POAD = Peripheral Occlusive Arterial Disease

PTA = Percutaneous Transluminal Angioplasty

Row B: - Laparotomy without reconstruction of aorta is also included (intention to treat)

- Juxtarenal AAA is included as well

Row C: - Femoro-femoral cross-over bypass is included here

Row F: - PTA of the renal and visceral arteries is not included

- PTA of reconstructions is included

Row L: - Only open surgical procedures are included

## NUMBER OF VASCULAR PROCEDURES PER COUNTY (= “AMT”) IN DENMARK 2001

The Danish Vascular Registry contains information regarding community and county of the patients, allowing for analysis of the frequency of vascular procedures on patients living in the different counties. The figures reveal huge differences between different parts of Denmark. The explanation is not known but could be due to differences in the prevalence of vascular disease (although not likely) or differences in the service offered.

### The Vascular Procedures for each county

All calculations are based on the postal code or community-code of each patient, as the basis for establishing in which county the patient is living. It is the primary operation that is used for the calculations, since it is the best indicator of the vascular service in each county.

The number of procedures is converted to numbers per 100,000 inhabitants by division with the population 1 January 2001 for each county. The information was obtained from the homepage of the National County Organisation (“Amtrådsforeningen”) at <http://www.arf.dk/>, under the heading *Statistik*.

The number of inhabitants in Greenland and the Faeroe Islands was obtained from:

Greenland: <http://www.greenland-guide.dk/gt/visit/intro-01.htm> (unknown year)

Faeroe Islands: <http://www.puffin.fo/travel/> (1.1.1999)

In the table below, *Denmark* is without Greenland and Faeroe Islands, whereas *All* includes them.

### Inhabitants per County (amt) 1<sup>st</sup> January 2001

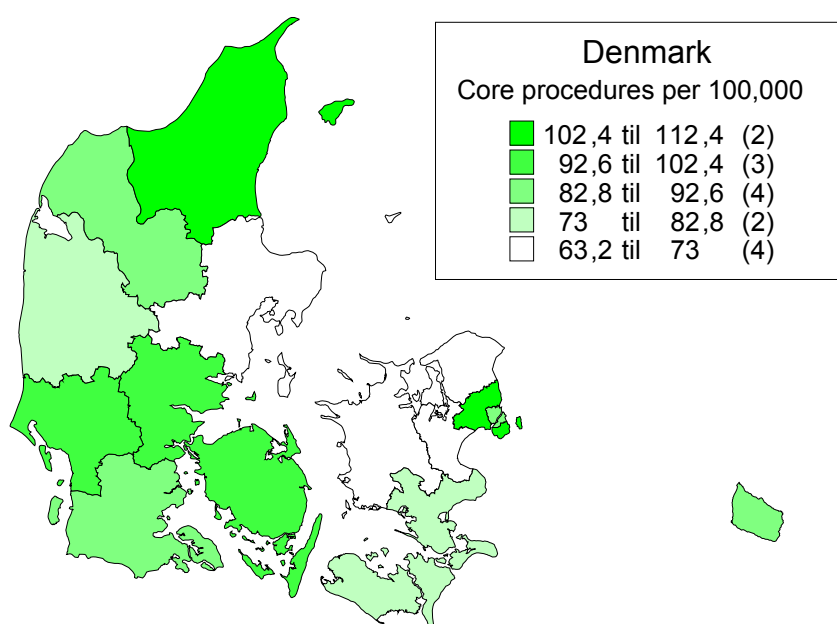
	County code	Inhabitants
H:S	13-14	590.224
Københavns amt	15	615.115
Frederiksborg amt	20	368.116
Roskilde amt	25	233.212
Vestsjællands amt	30	296.875
Storstrøms amt	35	259.691
Bornholms amt	40	44.126
Fyns amt	42	472.064
Sønderjyllands amt	50	253.249
Ribe amt	55	224.446
Vejle amt	60	349.186
Ringkøbing amt	65	273.517
Århus amt	70	640.637
Viborg amt	76	233.921
Nordjyllands amt	80	494.833
Greenland	90	55.000
Faeroe Islands	97	45.000
<b>DENMARK</b>		<b>5.349.212</b>
<b>ALL</b>		<b>5.449.212</b>

## All procedures, Core-procedures and Venous procedures

County	Code	All procedures		Core-procedures		Varicose veins	
		No.	Per 100,000	No.	Per 100,000	No.	Per 100,000
H:S	13-14	681	115	502	85	93	15,8
Københavns amt	15	962	156	690	112	204	33,2
Frederiksborg amt	20	475	129	240	65	136	36,9
Roskilde amt	25	198	85	161	69	32	13,7
Vestsjællands amt	30	231	78	193	65	17	5,7
Storstrøms amt	35	216	83	203	78	9	3,5
Bornholms amt	40	45	102	40	91	3	6,8
Fyns amt	42	544	115	477	101	5	1,1
Sønderjyllands amt	50	282	111	233	92	2	0,8
Ribe amt	55	413	184	221	98	116	51,7
Vejle amt	60	569	163	356	102	103	29,5
Ringkøbing amt	65	247	90	225	82	7	2,6
Århus amt	70	504	79	422	66	39	6,1
Viborg amt	76	448	192	212	91	124	53,0
Nordjyllands amt	80	956	193	521	105	277	56,0
Greenland	90	7	13	6	11	1	1,8
Faeroe Islands	97	22	49	22	49	0	0,0
Unknown / Other		86		44		13	
<b>Denmark</b>		<b>6771</b>	<b>127</b>	<b>4696</b>	<b>88</b>	<b>1167</b>	<b>21,8</b>
<b>All</b>		<b>6886</b>	<b>126</b>	<b>4768</b>	<b>87</b>	<b>1181</b>	<b>21,7</b>

The total number of operations exceeds the number of core-procedures and varicose veins. The missing operations primarily constitute angioaccess for haemodialysis, minor amputations etc.

In a document from the Danish National Board of Health (Sundhedsstyrelsen)<sup>1</sup> the need for vascular treatment was estimated on the basis of incidence of diseases and vascular surgical practice in other countries. The cumulated need for vascular procedures has been estimated to be 132 –140 arterial procedures per 100,000 inhabitants. In 2001, the core-procedures constituted 87 per 100,000 inhabitants, which are approximately 33% below the estimated need.

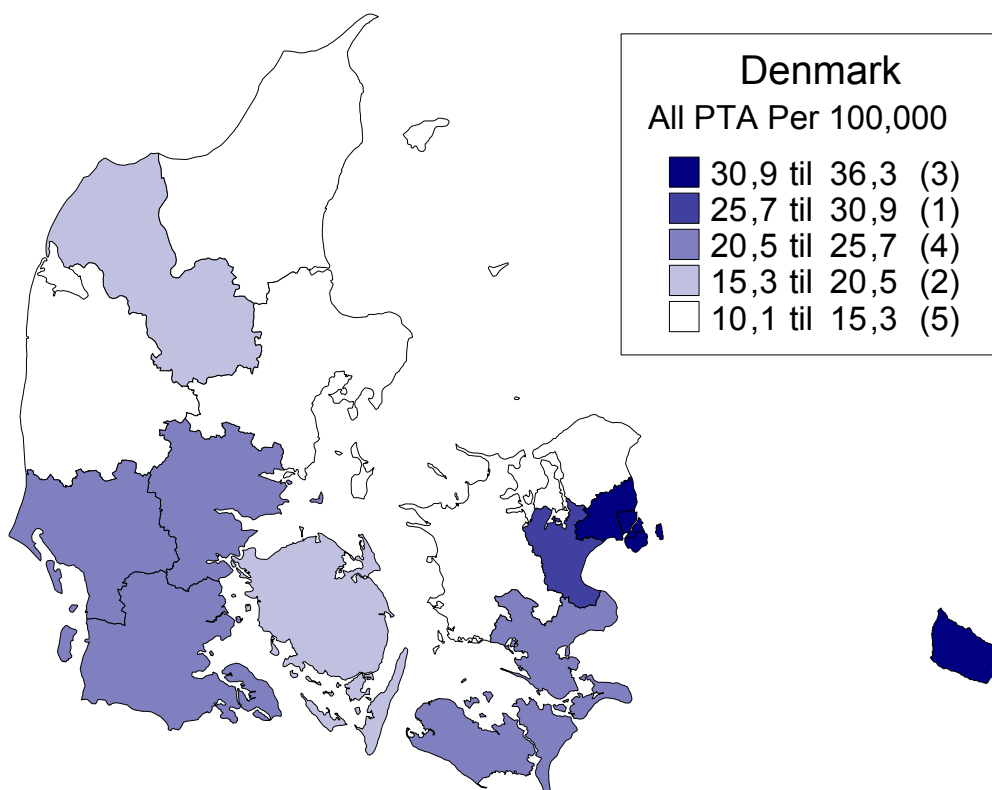


<sup>1</sup> KARKIRURGI – udvikling og organisation, notat, Sundhedsstyrelsen august 1994

## Percutaneous Transluminal Angioplasty (PTA, balloon-treatment)

County	Code	All PTA		Central PTA		Peripheral PTA	
		No.	Per 100,000	No.	Per 100,000	No.	Per 100,000
H:S	13-14	191	32	87	15	81	13,7
Københavns amt	15	210	34	133	22	46	7,5
Frederiksborg amt	20	41	11	23	6	11	3,0
Roskilde amt	25	60	26	25	11	5	2,1
Vestsjællands amt	30	45	15	27	9	2	0,7
Storstrøms amt	35	55	21	33	13	1	0,4
Bornholms amt	40	16	36	8	18	6	13,6
Fyns amt	42	95	20	82	17	8	1,7
Sønderjyllands amt	50	56	22	43	17	10	3,9
Ribe amt	55	49	22	20	9	27	12,0
Vejle amt	60	88	25	58	17	13	3,7
Ringkøbing amt	65	34	12	24	9	6	2,2
Århus amt	70	68	11	44	7	15	2,3
Viborg amt	76	41	18	30	13	3	1,3
Nordjyllands amt	80	50	10	33	7	6	1,2
Greenland	90	3	5	3	5	0	0,0
Faeroe Islands	97	8	18	5	11	3	6,7
Unknown / Other		5		3		0	
<b>Denmark</b>		<b>1099</b>	<b>21</b>	<b>670</b>	<b>13</b>	<b>240</b>	<b>4,5</b>
<b>All</b>		<b>1115</b>	<b>20</b>	<b>681</b>	<b>12</b>	<b>243</b>	<b>4,5</b>

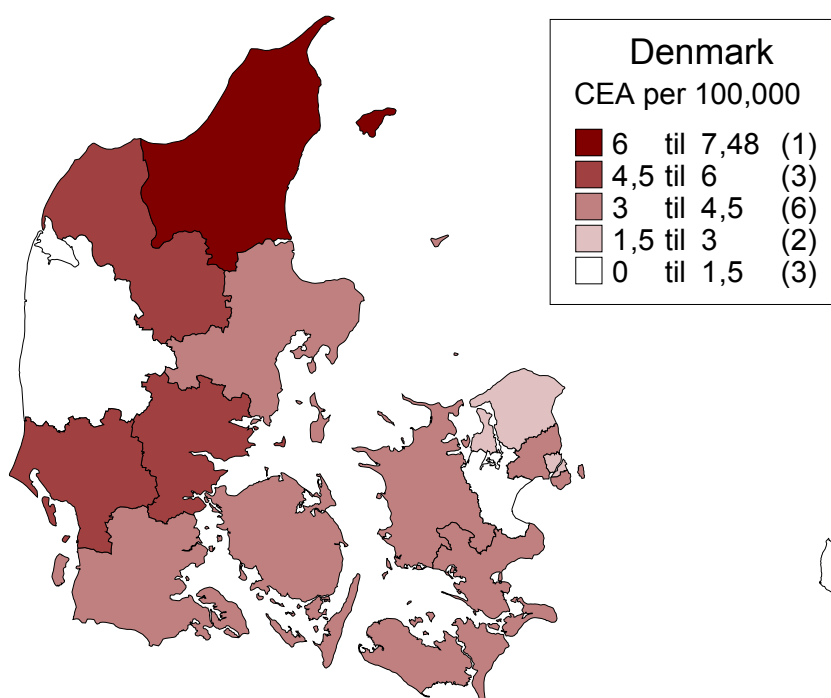
The table includes all PTA-procedures whether stents have been deployed or not. Presumably, not all Danish PTA-procedures are included in the figures above, since they some places are performed at radiological departments without direct involvement from the vascular departments.



## Carotid trombendarterectomy (TEA)

County	Code	Carotid TEA	
		No.	Per 100,000
H:S	13-14	15	2,5
Københavns amt	15	24	3,9
Frederiksborg amt	20	7	1,9
Roskilde amt	25	2	0,9
Vestsjællands amt	30	11	3,7
Storstrøms amt	35	8	3,1
Bornholms amt	40	0	0,0
Fyns amt	42	15	3,2
Sønderjyllands amt	50	8	3,2
Ribe amt	55	11	4,9
Vejle amt	60	19	5,4
Ringkøbing amt	65	2	0,7
Århus amt	70	20	3,1
Viborg amt	76	13	5,6
Nordjyllands amt	80	37	7,5
Greenland	90	1	1,8
Faeroe Islands	97	1	2,2
Unknown / Other		0	
<b>Denmark</b>		<b>192</b>	<b>3,6</b>
<b>All</b>		<b>194</b>	<b>3,6</b>

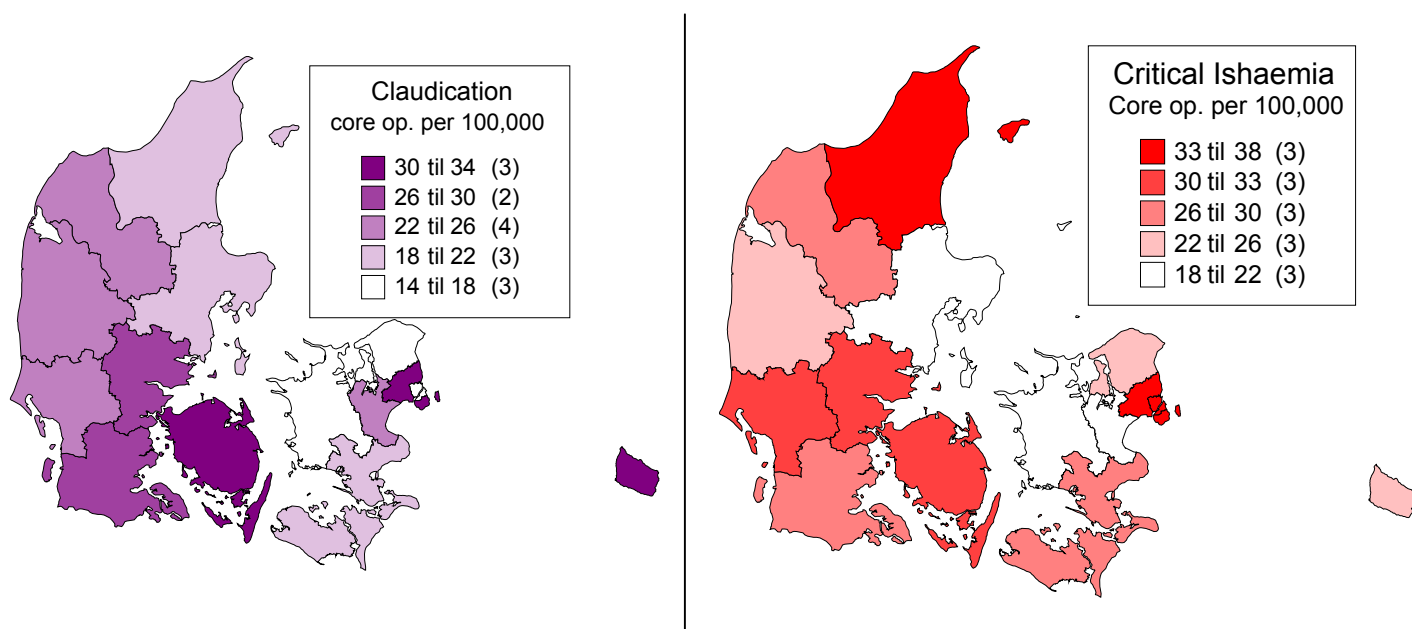
In Denmark, only symptomatic patients are operated on. In the recommendations from the central health authorities, the need is estimated to be 4-6 per 100,000 inhabitants, but according to international experience, the need is more likely 8-10 per 100,000 inhabitants. As it can be seen from the table, the actual figures are substantially lower, as they have been for the last years, and there are huge variations between the different counties.



## Peripheral Bypass Procedures, degree of ischaemia

County	Code	Peripheral bypass		Core operations for claudication		Core operations for Critical ischemia	
		No.	Per 100,000	No.	Per 100,000	No.	Per 100,000
<b>H:S</b>	13-14	73	12	81	14	223	38
<b>Københavns amt</b>	15	125	20	187	30	202	33
<b>Frederiksborg amt</b>	20	48	13	50	14	89	24
<b>Roskilde amt</b>	25	28	12	54	23	50	21
<b>Vestsjællands amt</b>	30	26	9	48	16	52	18
<b>Storstrøms amt</b>	35	30	12	47	18	73	28
<b>Bornholms amt</b>	40	3	7	15	34	10	23
<b>Fyns amt</b>	42	124	26	147	31	140	30
<b>Sønderjyllands amt</b>	50	45	18	66	26	67	26
<b>Ribe amt</b>	55	48	21	56	25	72	32
<b>Vejle amt</b>	60	82	23	94	27	108	31
<b>Ringkøbing amt</b>	65	41	15	69	25	60	22
<b>Århus amt</b>	70	81	13	134	21	118	18
<b>Viborg amt</b>	76	45	19	51	22	62	27
<b>Nordjyllands amt</b>	80	105	21	94	19	174	35
<b>Greenland</b>	90	0	0	3	5	1	2
<b>Faeroe Islands</b>	97	4	9	1	2	13	29
<b>Unknown / Other</b>		3		8		4	
<b>Denmark</b>		<b>904</b>	<b>17</b>	<b>1193</b>	<b>22</b>	<b>1500</b>	<b>28</b>
<b>All</b>		<b>911</b>	<b>17</b>	<b>1205</b>	<b>22</b>	<b>1518</b>	<b>28</b>

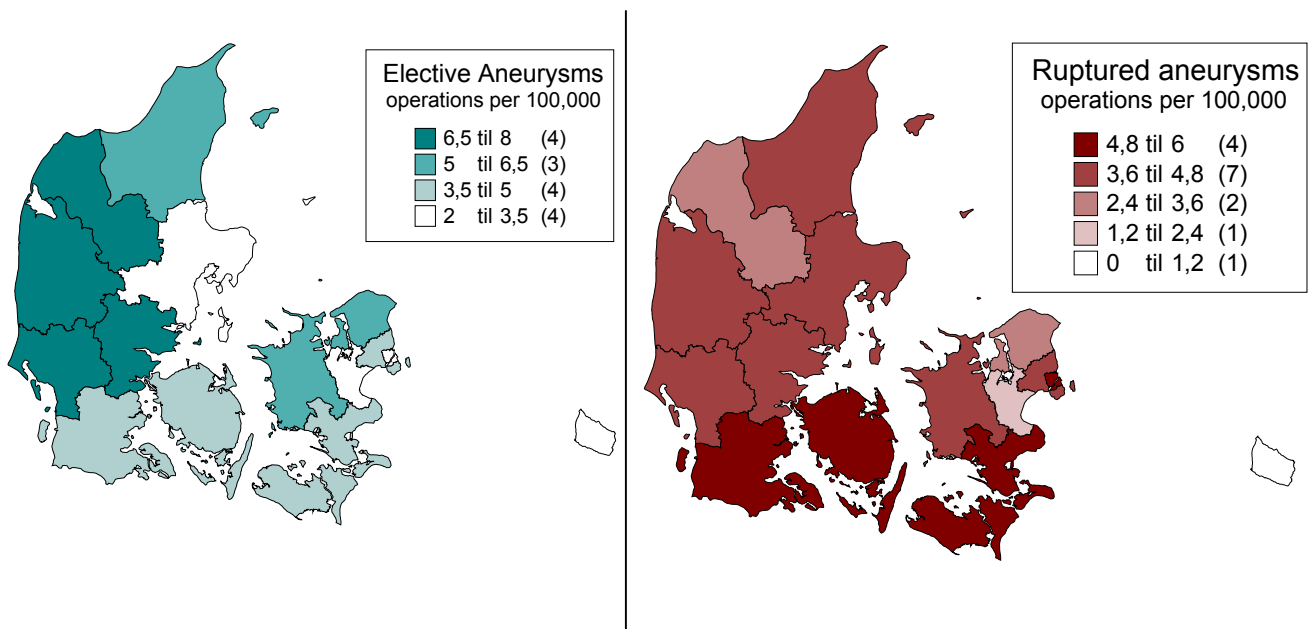
Patients with peripheral ischaemia can be graded with regard to the presence of intermittent claudication (muscle pain when walking) or critical ischaemia (pain at rest) non-healing ulcers or gangrene. The latter group risk a major amputation within a short period. The incidence of symptomatic atherosclerotic disease in the legs can be estimated to be 9000 per year in Denmark, but only a minority of these progresses to the need for an operation each year.



## Abdominal Aortic Aneurysms (AAA)

County	Code	All aneurysms		Elective operation		Operation for rupture	
		No.	Per 100,000	No.	Per 100,000	No.	Per 100,000
H:S	13-14	62	11	20	3	31	5
Københavns amt	15	70	11	24	4	25	4
Frederiksborg amt	20	36	10	19	5	12	3
Roskilde amt	25	13	6	7	3	5	2
Vestsjællands amt	30	33	11	15	5	11	4
Storstrøms amt	35	28	11	11	4	14	5
Bornholms amt	40	1	2	1	2	0	0
Fyns amt	42	66	14	20	4	27	6
Sønderjyllands amt	50	30	12	10	4	13	5
Ribe amt	55	31	14	16	7	9	4
Vejle amt	60	46	13	25	7	14	4
Ringkøbing amt	65	37	14	19	7	11	4
Århus amt	70	58	9	16	2	24	4
Viborg amt	76	33	14	19	8	8	3
Nordjyllands amt	80	56	11	26	5	20	4
Greenland	90	0	0	0	0	0	0
Faeroe Islands	97	3	7	3	7	0	0
Unknown / Other		11		2		8	
<b>Denmark</b>		<b>600</b>	<b>11</b>	<b>248</b>	<b>5,0</b>	<b>224</b>	<b>4,2</b>
<b>All</b>		<b>614</b>	<b>11</b>	<b>253</b>	<b>5,0</b>	<b>232</b>	<b>4,3</b>

Besides the two groups *elective* and *ruptured*, the total figures above for abdominal aneurysm repair includes the groups *acute* and *other* mentioned in the table of [primary procedures](#).





## **THE QUALITY OF TREATMENT 2001**

The evaluation of various quality aspects of the treatments offered is very complicated. It is of course essential that registration covers reliable and validated indicators, that the indicators are registered in a uniform manner, and that the registration is complete. An evaluation of this process is laborious, but necessary. The Danish Vascular Registry has performed such an evaluation on the 1998 data, which will be published soon, the results have been presented at several occasions at meetings.

The aim of vascular surgery is to prevent amputation, stroke and death from vascular atherosclerotic and aneurysmatic disease, but also to reduce the consequences in the form of pain, immobility and discomfort. In the Danish Vascular Registry several indicators are registered to document this: Amputation, stroke and death. Other quality-indicators are perioperative complications (e.g. surgical wound infection), and social conditions before and after surgery. Not all of these indicators have been sufficiently validated currently, and should therefore be interpreted with caution.

Another factor complicating the interpretation of quality indicators is the diversion in risk factors and prognostic factors among the patients; the more ill the patient is before treatment (heart, lungs, etc.) the worse the outcome. There is therefore a need for case-mix correction, or explanation, of results regarding the use of risk factors. There is a huge methodological work to be done in this field, but progress is constantly made, allowing for more detailed analyses to be published. Uncorrected data can be misleading when comparing units.

The data on the next pages should be looked at with the above-mentioned words of caution in mind, as no case-mix corrections have been made.

## Clean operations and surgical wound infections 2001

*The figures only include operations classified as clean or potentially contaminated*

Procedure	Procedures No.	Superficial Wound Infections		Deep Wound Infections		All Wound Infections	
		No.	%	No.	%	No.	%
<b>TEA a. carotis</b>	<b>194</b>	1	0,5	0		1	0,5
<b>Other supraaortic operation</b>	<b>28</b>	0		0		0	
<b>Visceral operation</b>	<b>27</b>	0		0		0	
Renal	11	0		0		0	
Mesenteric	16	0		0		0	
<b>Aorto/iliac-femoral bypass</b>	<b>330</b>	7	2,1	4	1,2	11	3,3
Open surgery	319	7	2,2	4	1,3	11	3,4
Endovascular	12	0		0		0	
<b>Abdominal Aortic Aneurysm</b>	<b>612</b>	14	2,3	6	1,0	20	3,3
Open surgery	601	13	2,2	6	1,0	19	3,2
Ruptured	231	7	3,0	3	1,3	10	4,3
Acute	94	1	1,1	2	2,1	3	3,2
Elective	253	5	2,0	1	0,4	6	2,4
Other (fibrosis etc.)	23	0		0		0	
Endovascular	11	1	9,1	0		1	9,1
<b>Other aneurysms</b>	<b>144</b>	3	2,1	1	0,7	4	2,8
<b>Aorto-iliac TEA</b>	<b>75</b>	3	4,0	1	1,3	4	5,3
<b>Other TEA</b>	<b>146</b>	2	1,4	0		2	1,4
<b>Fem-fem cross-over bypass</b>	<b>225</b>	3	1,3	4	1,8	7	3,1
<b>Fem-pop bypass AK</b>	<b>242</b>	10	4,1	2	0,8	12	5,0
Prosthesis	219	10	4,6	1	0,5	11	5,0
In situ	18	0		1	5,6	1	5,6
Other	5	0		0		0	
<b>Fem-pop bypass BK</b>	<b>247</b>	20	8,1	8	3,2	28	11,3
Prosthesis	51	4	7,8	2	3,9	6	11,8
In situ	181	14	7,7	6	3,3	20	11,0
Other	15	2	13,3	0		2	13,3
<b>Fem-crural bypass</b>	<b>413</b>	17	4,1	11	2,7	28	6,8
Prosthesis	35	1	2,9	1	2,9	2	5,7
In situ	336	15	4,5	10	3,0	25	7,4
Other	42	1	2,4	0		1	2,4
<b>Other arterial bypass</b>	<b>88</b>	1	1,1	4	4,5	5	5,7
<b>Embolectomy/Thrombectomy</b>	<b>399</b>	4	1,0	1	0,3	5	1,3
Bypass	92	1	1,1	1	1,1	2	2,2
Arteries	307	3	1,0	0		3	1,0
<b>Arterial thrombolysis</b>	<b>155</b>	0		1	0,6	1	0,6
<b>PTA</b>	<b>1113</b>	3	0,3	1	0,1	4	0,4
Aorto-iliac	681	3	0,4	1	0,1	4	0,6
Femoro-crural	241	0		0		0	
Bypass	86	0		0		0	
Other	105	0		0		0	
<b>Venous procedures</b>	<b>1239</b>	4	0,3	1	0,1	5	0,4
Varicose veins	1180	4	0,3	0		4	0,3
Thrombolysis / thrombectomy	34	0		1	2,9	1	2,9
Other	25	0		0		0	
<b>Reoperations</b>	<b>111</b>	5	4,5	4	3,6	9	8,1
<b>Other arterial operations</b>	<b>591</b>	1	0,2	1	0,2	2	0,3
<b>Other operations</b>	<b>252</b>	1	0,4	1	0,4	2	0,8
<b>All</b>	<b>6632</b>	<b>99</b>	<b>1,5</b>	<b>51</b>	<b>0,8</b>	<b>150</b>	<b>2,3</b>

The level of Surgical Wound Infections is acceptable and lives up to international standards.

## Primary operations and complications 2001

Procedure	No.	30 day Occlusion		Wound complications		Surgical complications		General complications		30 day mortality	
		No.	%	No.	%	No.	%	No.	%	No.	%
<b>TEA a. carotis</b>	<b>194</b>	0		11	5,7	20	10,3	12	6,2	3	1,5
<b>Other supraaortic operation</b>	<b>28</b>	2	7,1	4	14,3	0		0		1	3,6
<b>Visceral operation</b>	<b>28</b>	1	3,6	0		1	3,6	6	21,4	11	39,3
Renal	12	1	8,3	0		1	8,3	5	41,7	4	33,3
Mesenteric	16	0		0		0		1	6,3	7	43,8
<b>Aorto/iliac-femoral bypass</b>	<b>338</b>	10	3,0	29	8,6	20	5,9	52	15,4	18	5,3
Open surgery	326	10	3,1	28	8,6	20	6,1	52	16,0	18	5,5
Endovascular	12	0		1	8,3	0		0		0	
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	4	0,7	42	6,8	96	15,6	227	37,0	127	20,7
Open surgery	603	4	0,7	41	6,8	96	15,9	227	37,6	127	21,1
Ruptured	232	2	0,9	18	7,8	56	24,1	127	54,7	102	44,0
Acute	94	0		1	1,1	8	8,5	26	27,7	9	9,6
Elective	253	2	0,8	21	8,3	27	10,7	68	26,9	14	5,5
Other (fibrosis etc.)	24	0		1	4,2	5	20,8	6	25,0	2	8,3
Endovascular	11	0		1	9,1	0		0		0	
<b>Other aneurysms</b>	<b>154</b>	3	1,9	22	14,3	4	2,6	11	7,1	8	5,2
<b>Aorto-Iliac TEA</b>	<b>76</b>	1	1,3	6	7,9	6	7,9	2	2,6	0	
<b>Other TEA</b>	<b>146</b>	4	2,7	15	10,3	3	2,1	8	5,5	6	4,1
<b>Fem-fem cross-over bypass</b>	<b>227</b>	6	2,6	27	11,9	4	1,8	19	8,4	12	5,3
<b>Fem-pop bypass AK</b>	<b>243</b>	10	4,1	24	9,9	6	2,5	10	4,1	4	1,6
Prosthesis	220	8	3,6	19	8,6	6	2,7	7	3,2	2	0,9
In situ	18	2	11,1	5	27,8	0		3	16,7	2	11,1
Other	5	0		0		0		0		0	
<b>Fem-pop bypass BK</b>	<b>250</b>	34	13,6	50	20,0	7	2,8	21	8,4	12	4,8
Prosthesis	51	4	7,8	9	17,6	2	3,9	7	13,7	4	7,8
In situ	183	25	13,7	40	21,9	4	2,2	13	7,1	7	3,8
Other	16	5	31,3	1	6,3	1	6,3	1	6,3	1	6,3
<b>Fem-crural bypass</b>	<b>413</b>	41	9,9	69	16,7	7	1,7	34	8,2	20	4,8
Prosthesis	35	4	11,4	1	2,9	0		3	8,6	2	5,7
In situ	336	33	9,8	62	18,5	7	2,1	29	8,6	16	4,8
Other	42	4	9,5	6	14,3	0		2	4,8	2	4,8
<b>Other arterial bypass</b>	<b>95</b>	4	4,2	7	7,4	6	6,3	11	11,6	8	8,4
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	42	10,5	14	3,5	8	2,0	35	8,7	68	17,0
Bypass	94	15	16,0	11	11,7	4	4,3	10	10,6	7	7,4
Arteries	307	27	8,8	3	1,0	4	1,3	25	8,1	61	19,9
<b>Arterial thrombolysis</b>	<b>155</b>	13	8,4	8	5,2	5	3,2	12	7,7	6	3,9
<b>PTA</b>	<b>1120</b>	39	3,5	52	4,6	22	2,0	20	1,8	18	1,6
Aorto-iliac	681	16	2,3	35	5,1	7	1,0	17	2,5	9	1,3
Femoro-crural	248	17	6,9	11	4,4	13	5,2	3	1,2	7	2,8
Bypass	86	4	4,7	4	4,7	1	1,2	0		1	1,2
Other	105	2	1,9	2	1,9	1	1,0	0		1	1,0
<b>Venous procedures</b>	<b>1242</b>	5	0,4	9	0,7	3	0,2	6	0,5	3	0,2
Varicose veins	1181	1	0,1	7	0,6	2	0,2	5	0,4	1	0,1
Thrombolysis / thrombectomy	20	1	5,0	1	5,0	1	5,0	1	5,0	0	
Other	36	2	5,6	1	2,8	0		0		2	5,6
<b>Reoperations</b>	<b>195</b>	3	1,5	32	16,4	3	1,5	9	4,6	5	2,6
<b>Other arterial operations</b>	<b>629</b>	15	2,4	22	3,5	6	1,0	11	1,7	31	4,9
<b>Other operations</b>	<b>343</b>	1	0,3	10	2,9	2	0,6	10	2,9	22	6,4
<b>All</b>	<b>6886</b>	<b>237</b>	<b>3,4</b>	<b>453</b>	<b>6,6</b>	<b>229</b>	<b>3,3</b>	<b>516</b>	<b>7,5</b>	<b>383</b>	<b>5,6</b>

It has been agreed, that the high mortality of mesenteric operations shall be subject for an audit, the result will be published in the next annual report.

## Wound Complications

Procedure	No.	All Wound complications		Haemathoma		Lymph oozing / Lymphocele		Sloughing Wound Edge	
		No.	%	No.	%	No.	%	No.	%
<b>TEA a. carotis</b>	<b>194</b>	11	5,7	11	5,7	0		0	
<b>Other supraaortic operation</b>	<b>28</b>	4	14,3	2	7,1	1	3,6	1	3,6
<b>Visceral operation</b>	<b>28</b>	0		0		0		0	
Renal	12	0		0		0		0	
Mesenteric	16	0		0		0		0	
<b>Aorto/iliac-femoral bypass</b>	<b>336</b>	29	8,6	6	1,8	20	6,0	3	0,9
Open surgery	326	28	8,6	5	1,5	20	6,1	3	0,9
Endovascular	12	1	8,3	1	8,3	0		0	
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	42	6,8	16	2,6	22	3,6	6	1,0
Open surgery	603	41	6,8	16	2,7	21	3,5	6	1,0
Ruptured	232	18	7,8	7	3,0	8	3,4	3	1,3
Acute	94	1	1,1	0		0		1	1,1
Elective	253	21	8,3	8	3,2	12	4,7	2	0,8
Other (fibrosis etc.)	24	1	4,2	1	4,2	1	4,2	0	
Endovascular	11	1	9,1	0		1	9,1	0	
<b>Other aneurysms</b>	<b>153</b>	21	13,7	11	7,2	9	5,9	1	0,7
<b>Aorto-Iliac TEA</b>	<b>76</b>	6	7,9	3	3,9	3	3,9	0	
<b>Other TEA</b>	<b>146</b>	15	10,3	5	3,4	8	5,5	1	0,7
<b>Fem-fem cross-over bypass</b>	<b>227</b>	27	11,9	11	4,8	9	4,0	7	3,1
<b>Fem-pop bypass AK</b>	<b>243</b>	24	9,9	7	2,9	16	6,6	2	0,8
Prosthesis	220	19	8,6	6	2,7	11	5,0	2	0,9
In situ	18	5	27,8	1	5,6	5	27,8	0	
Other	5	0		0		0		0	
<b>Fem-pop bypass BK</b>	<b>250</b>	50	20,0	8	3,2	34	13,6	11	4,4
Prosthesis	51	9	17,6	1	2,0	5	9,8	3	5,9
In situ	183	40	21,9	7	3,8	29	15,8	7	3,8
Other	16	1	6,3	0		0		1	6,3
<b>Fem-crural bypass</b>	<b>413</b>	69	16,7	15	3,6	32	7,7	24	5,8
Prosthesis	35	1	2,9	0		1	2,9	0	
In situ	336	62	18,5	13	3,9	29	8,6	22	6,5
Other	42	6	14,3	2	4,8	2	4,8	2	4,8
<b>Other arterial bypass</b>	<b>95</b>	7	7,4	3	3,2	3	3,2	1	1,1
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	14	3,5	6	1,5	8	2,0	0	
Bypass	94	11	11,7	3	3,2	8	8,5	0	
Arteries	307	3	1,0	3	1,0	0		0	
<b>Arterial thrombolysis</b>	<b>155</b>	8	5,2	5	3,2	2	1,3	1	0,6
<b>PTA</b>	<b>1115</b>	52	4,7	42	3,8	8	0,7	5	0,4
Aorto-Iliac	681	35	5,1	29	4,3	5	0,7	4	0,6
Femoro-crural	243	11	4,5	10	4,1	1	0,4	0	
Bypass	86	4	4,7	2	2,3	1	1,2	1	1,2
Other	105	2	1,9	1	1,0	1	1,0	0	
<b>Venous procedures</b>	<b>1242</b>	9	0,7	8	0,6	1	0,1	0	
Varicose veins	1181	7	0,6	7	0,6	0		0	
Thrombolysis / thrombectomy	35	2	5,7	1	2,9	1	2,9	0	
Other	26	0		0		0		0	
<b>Reoperations</b>	<b>195</b>	32	16,4	5	2,6	22	11,3	5	2,6
<b>Other arterial operations</b>	<b>630</b>	23	3,7	9	1,4	7	1,1	7	1,1
<b>Other operations</b>	<b>343</b>	10	2,9	2	0,6	3	0,9	4	1,2
<b>All</b>	<b>6886</b>	<b>453</b>	<b>6,6</b>	<b>175</b>	<b>2,5</b>	<b>208</b>	<b>3,0</b>	<b>79</b>	<b>1,1</b>

## Other surgical complications 2001 (percent)

Procedure	No.	All	Bleeding	Ruptured abdominal fascia	Bowel obstruction	Ischaemic colon	Peripheral Embolisation	Major neurological	Nerve lesion
<b>TEA a. carotis</b>	<b>194</b>	10,3	3,1	-	-	-	-	6,7	1,5
<b>Other supraaortic operation</b>	<b>28</b>	-	-	-	-	-	-	-	-
<b>Visceral operation</b>	<b>28</b>	3,6	3,6	-	-	3,6	-	-	-
Renal	12	8,3	8,3	-	-	8,3	-	-	-
Mesenteric	16	-	-	-	-	-	-	-	-
<b>Aorto/iliac-femoral bypass</b>	<b>336</b>	6,0	0,9	0,6	0,3	3,0	1,5	-	-
Open surgery	326	6,1	0,9	0,6	0,3	3,1	1,5	-	-
Endovascular	12	-	-	-	-	-	-	-	-
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	15,6	5,7	3,3	1,8	5,0	1,0	-	0,8
Open surgery	603	15,9	5,8	3,3	1,8	5,1	1,0	-	0,8
Ruptured	232	24,1	9,1	4,3	3,0	8,2	1,3	-	0,4
Acute	94	8,5	2,1	4,3	-	2,1	1,1	-	1,1
Elective	253	10,7	4,3	1,6	1,6	3,2	0,8	-	1,2
Other (fibrosis etc.)	24	20,8	4,2	8,3	-	8,3	-	-	-
Endovascular	11	-	-	-	-	-	-	-	-
<b>Other aneurysms</b>	<b>153</b>	2,0	1,3	0,7	-	0,7	0,7	-	-
<b>Aorto-Iliac TEA</b>	<b>76</b>	7,9	6,6	-	-	1,3	-	-	1,3
<b>Other TEA</b>	<b>146</b>	2,1	1,4	-	-	-	-	-	0,7
<b>Fem-fem cross-over bypass</b>	<b>227</b>	1,8	1,8	-	-	-	-	-	-
<b>Fem-pop bypass AK</b>	<b>243</b>	2,5	0,4	-	0,4	0,4	0,4	-	-
Prosthesis	220	2,7	0,5	-	0,5	0,5	0,5	-	-
In situ	18	-	-	-	-	-	-	-	-
Other	5	-	-	-	-	-	-	-	-
<b>Fem-pop bypass BK</b>	<b>250</b>	2,8	2,4	-	-	-	0,4	-	-
Prosthesis	51	3,9	3,9	-	-	-	-	-	-
In situ	183	2,2	2,2	-	-	-	-	-	-
Other	16	6,3	-	-	-	-	6,3	-	-
<b>Fem-crural bypass</b>	<b>413</b>	1,7	1,2	-	-	-	-	-	0,5
Prosthesis	35	-	-	-	-	-	-	-	-
In situ	336	2,1	1,5	-	-	-	-	-	0,6
Other	42	-	-	-	-	-	-	-	-
<b>Other arterial bypass</b>	<b>95</b>	6,3	3,2	-	-	1,1	1,1	-	-
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	2,0	0,7	0,2	0,2	0,2	0,5	-	0,2
Bypass	94	4,3	1,1	1,1	1,1	-	1,1	-	-
Arteries	307	1,3	0,7	-	-	0,3	0,3	-	0,3
<b>Arterial thrombolysis</b>	<b>155</b>	3,2	1,9	-	-	0,6	0,6	-	-
<b>PTA</b>	<b>1115</b>	2,0	0,6	0,2	-	0,1	1,0	-	-
Aorto-Iliac	681	1,0	0,1	0,3	-	0,1	0,3	-	-
Femoro-crural	243	5,3	1,6	-	-	-	3,7	-	-
Bypass	86	1,2	1,2	-	-	-	-	-	-
Other	105	1,0	1,0	-	-	-	-	-	-
<b>Venous procedures</b>	<b>1242</b>	0,2	0,1	-	-	-	-	-	0,2
Varicose veins	1181	0,2	-	-	-	-	-	-	0,2
Thrombolysis / thrombectomy	35	2,9	2,9	-	-	-	-	-	-
Other	26	-	-	-	-	-	-	-	-
<b>Reoperations</b>	<b>195</b>	1,5	0,5	0,5	-	-	-	-	0,5
<b>Other arterial operations</b>	<b>630</b>	1,1	1,0	-	-	-	-	-	0,2
<b>Other operations</b>	<b>343</b>	0,6	0,3	0,3	-	-	-	-	-
<b>All</b>	<b>6886</b>	<b>3,3</b>	<b>1,4</b>	<b>0,4</b>	<b>0,2</b>	<b>0,7</b>	<b>0,4</b>	<b>0,2</b>	<b>0,2</b>

## General complications 2001 (percent)

Procedure	No.	All	Cardiac	Pulmonary	Impaired renal function	Dialysis	Stroke	Deep Venous Thrombosis	Pulmonary embolism	Compartment syndrome	Multi Organ Failure
<b>TEA a. carotis</b>	<b>194</b>	6,2	2,1	-	-	-	2,1	-	-	-	-
<b>Other supraaortic operation</b>	<b>28</b>	-	-	-	-	-	-	-	-	-	-
<b>Visceral operation</b>	<b>28</b>	21,4	3,6	7,1	7,1	3,6	3,6	-	-	3,6	3,6
Renal	12	41,7	-	16,7	16,7	8,3	-	-	-	8,3	8,3
Mesenteric	16	6,3	6,3	-	-	-	6,3	-	-	-	-
<b>Aorto/iliac-femoral bypass</b>	<b>336</b>	15,5	6,3	5,1	2,7	1,8	1,5	-	-	0,6	1,5
Open surgery	326	16,0	6,4	5,2	2,8	1,8	1,5	-	-	0,6	1,5
Endovascular	12	-	-	-	-	-	-	-	-	-	-
<b>Abdominal Aortic Aneurysm</b>	<b>614</b>	37,0	14,8	12,5	10,4	7,2	0,5	0,2	0,3	0,8	5,0
Open surgery	603	37,6	15,1	12,8	10,6	7,3	0,5	0,2	0,3	0,8	5,1
Ruptured	232	54,7	22,0	15,9	18,1	12,9	1,3	-	0,4	-	9,5
Acute	94	27,7	11,7	11,7	8,5	3,2	-	-	-	1,1	4,3
Elective	253	26,9	10,7	10,7	4,3	3,2	-	0,4	0,4	1,6	2,0
Other (fibrosis etc.)	24	25,0	8,3	8,3	12,5	12,5	-	-	-	-	-
Endovascular	11	-	-	-	-	-	-	-	-	-	-
<b>Other aneurysms</b>	<b>153</b>	6,5	2,0	2,6	0,7	0,7	-	-	0,7	-	0,7
<b>Aorto-Iliac TEA</b>	<b>76</b>	2,6	2,6	-	-	-	-	-	-	-	-
<b>Other TEA</b>	<b>146</b>	5,5	2,7	1,4	0,7	-	0,7	-	-	-	-
<b>Fem-fem cross-over bypass</b>	<b>227</b>	8,4	4,4	1,3	2,2	1,3	-	-	-	0,4	0,9
<b>Fem-pop bypass AK</b>	<b>243</b>	4,1	2,5	0,4	1,6	0,4	0,4	-	-	0,4	-
Prosthesis	220	3,2	1,8	0,5	0,9	-	-	-	-	-	-
In situ	18	16,7	11,1	-	11,1	5,6	5,6	-	-	5,6	-
Other	5	-	-	-	-	-	-	-	-	-	-
<b>Fem-pop bypass BK</b>	<b>250</b>	8,4	4,4	2,0	1,6	-	0,8	-	-	0,4	0,4
Prosthesis	51	13,7	7,8	5,9	2,0	-	-	-	-	-	-
In situ	183	7,1	3,3	1,1	1,6	-	0,5	-	-	0,5	0,5
Other	16	6,3	6,3	-	-	-	6,3	-	-	-	-
<b>Fem-crural bypass</b>	<b>413</b>	8,2	4,8	2,4	1,2	0,2	0,2	-	-	-	-
Prosthesis	35	8,6	5,7	2,9	2,9	-	-	-	-	-	-
In situ	336	8,6	5,1	2,4	0,9	0,3	0,3	-	-	-	-
Other	42	4,8	2,4	2,4	2,4	-	-	-	-	-	-
<b>Other arterial bypass</b>	<b>95</b>	11,6	2,1	2,1	2,1	-	3,2	-	-	1,1	1,1
<b>Embolectomy/Thrombectomy</b>	<b>401</b>	8,7	3,2	1,7	1,0	0,5	0,5	0,5	0,5	1,5	0,7
Bypass	94	10,6	2,1	1,1	1,1	1,1	-	-	-	3,2	3,2
Arteries	307	8,1	3,6	2,0	1,0	0,3	0,7	0,7	0,7	1,0	-
<b>Arterial thrombolysis</b>	<b>155</b>	7,7	3,9	-	-	1,3	-	-	-	-	-
<b>PTA</b>	<b>1115</b>	1,8	1,4	0,2	0,3	-	0,1	-	-	-	0,1
Aorto-Iliac	681	2,5	1,9	0,3	0,1	-	0,1	-	-	-	-
Femoro-crural	243	1,2	1,2	-	0,8	-	-	-	-	-	0,4
Bypass	86	-	-	-	-	-	-	-	-	-	-
Other	105	-	-	-	-	-	-	-	-	-	-
<b>Venous procedures</b>	<b>1242</b>	0,5	0,1	0,1	-	-	-	0,1	-	-	-
Varicose veins	1181	0,4	0,1	0,1	-	-	-	0,1	-	-	-
Thrombolysis / thrombectomy	35	2,9	-	-	-	-	-	-	-	-	-
Other	26	-	-	-	-	-	-	-	-	-	-
<b>Reoperations</b>	<b>195</b>	4,6	1,5	1,5	0,5	-	0,5	-	-	1,0	-
<b>Other arterial operations</b>	<b>630</b>	1,9	0,3	0,5	0,6	0,3	-	-	-	-	0,3
<b>Other operations</b>	<b>343</b>	2,9	0,9	1,5	0,6	-	0,3	-	-	-	-
<b>All</b>	<b>6886</b>	<b>7,5</b>	<b>3,2</b>	<b>2,1</b>	<b>1,6</b>	<b>0,9</b>	<b>0,4</b>	<b>0,1</b>	<b>0,1</b>	<b>0,3</b>	<b>0,7</b>

## PRESENTATION OF RESULTS FOR THE DEPARTMENTS

The quality data in this report are also given with results from each department. The name of the department is, however, *not* given, since the focus of the national report is on nation-wide variations rather than the individual departmental result. Each department is given its own result for comparison with results from other department, which leads to the first step in the quality process, the *internal audit*. If results divert significantly from the average, or are significantly worse than the accepted standards, attention should be given to explain and presumably correct the problem. If the poor results tend to be repeated over the years, it may lead to *external audit* initiated from the department itself or the board of the Danish Vascular Registry. In addition to the obvious explanation that bad results are a consequence of poor performance, reported bad results can emerge from improper understanding of the definitions of the dataset, improper data handling, missing follow-up or factors related to risk factors and patient selection. Although the interpretation of data can get very complicated, it is still of great importance to publish the inter-department variation for the sake of auditing. Of course, it should be kept in mind that variations are inevitable according to the rules of statistics. When 11 departments are compared, there will always be about half below and above average, even if all are performing excellently.

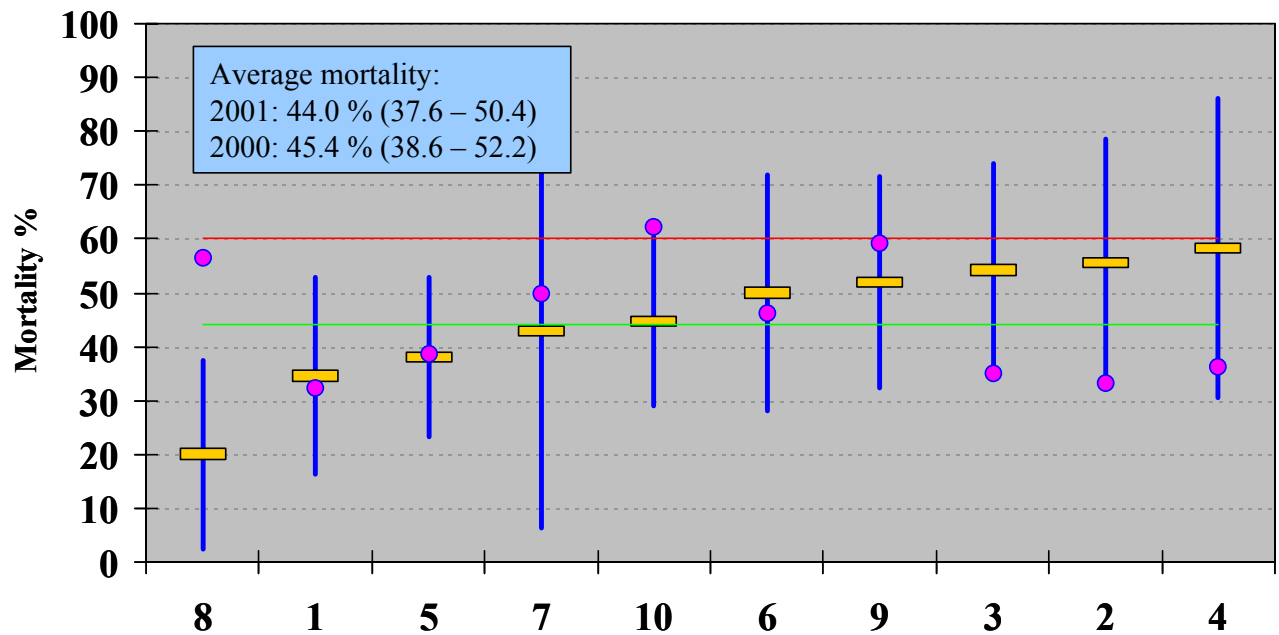
To the public (patients) these data on variation are of lesser interest; here the important question is whether the department lives up to established levels of good standards or not. Therefore a separate version with basic well explained statistics is planned for the coming years, aiming at the non-professional public.

Few standards have been established in vascular surgery, but some will be presented in the next pages.

### Explanation of the figures

The figures below are structured in the same way: The result of each department is marked with a short horizontal (yellow) line, and the departments are ranked from best to worse. The 95% statistical confidence limit is marked with a vertical (blue) line, indicating how precise and how reliable the result is allowed to be interpreted. A (green) horizontal line marks the average result, and when known, a (red) horizontal line marks the established standard for good performance. Finally, a (purple) dot marks the result from 2000 for comparison with this years result, and the ranking of the department in 2000 is given on the x-axis. The mortality data are corrected from the Civil Registry System, and are thus complete and 100% reliable.

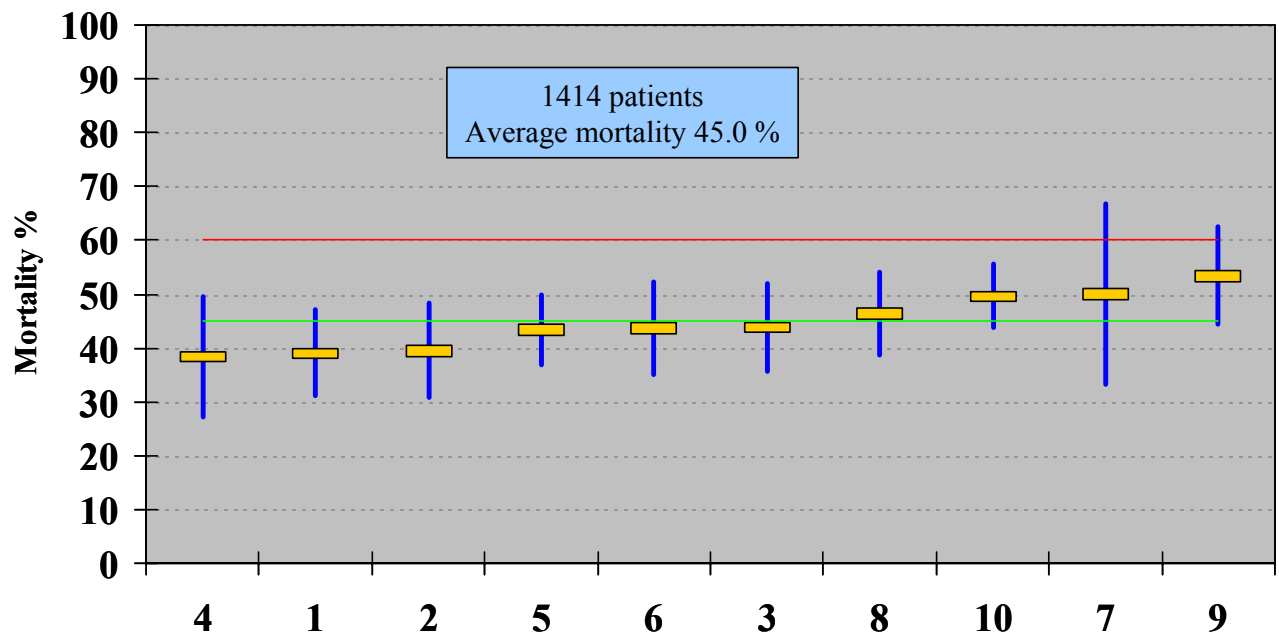
### 30 day mortality for operation of Ruptured Abdominal Aortic Aneurysm 2001



Patients dying during the operation are included, but patients, who died before the operation could be initiated, are not included. Untreated, this condition bears 100% mortality within hours or days. The Scandinavian standard for treatment of this disease is mortality below 60%<sup>2</sup>, and the national average of 45% is well below. All departments seems to have satisfactory results.

The Danish Vascular Registry has in its present form been collecting data since 1996. It could therefore be of interest to calculate the departmental mortality over the full 6 years period, as shown below:

### 30 day mortality for operation of ruptured Abdominal Aortic Aneurysm 1996 – 2001

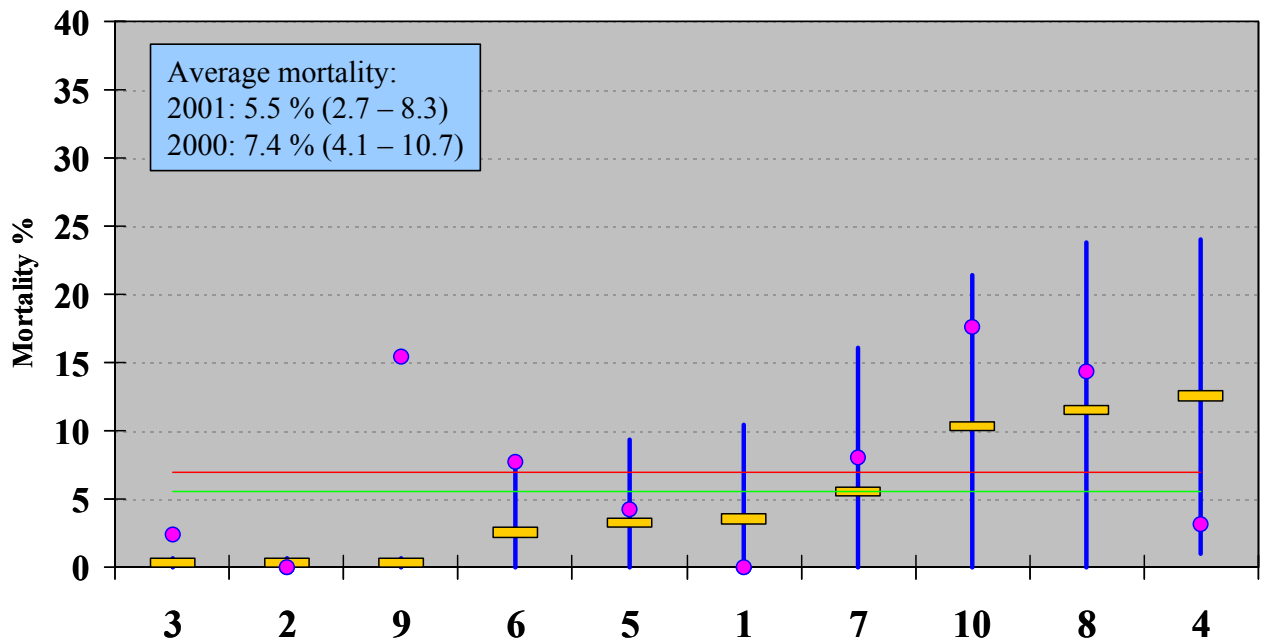


As seen, the variations narrows around the average, and the confidence limits becomes smaller, indicating that the departments performs equally well.

<sup>2</sup> Bergqvist D et al. Nordisk Medicin 1994; 109: 10: 256-7



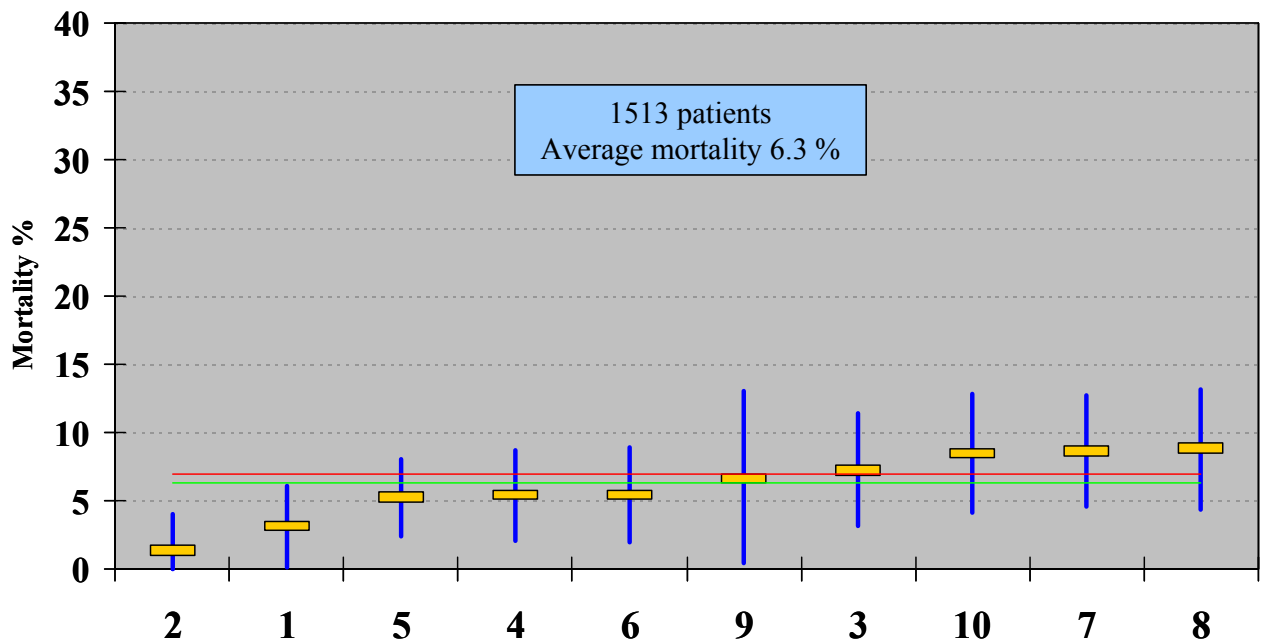
### 30 day mortality for operation of Elective Abdominal Aortic Aneurysm 2001



The average mortality has improved from the unsatisfactory results in 2000. No local audit report are available, so the reason is still unexplained. Like the previous years huge shift in ranking are seen among departments.

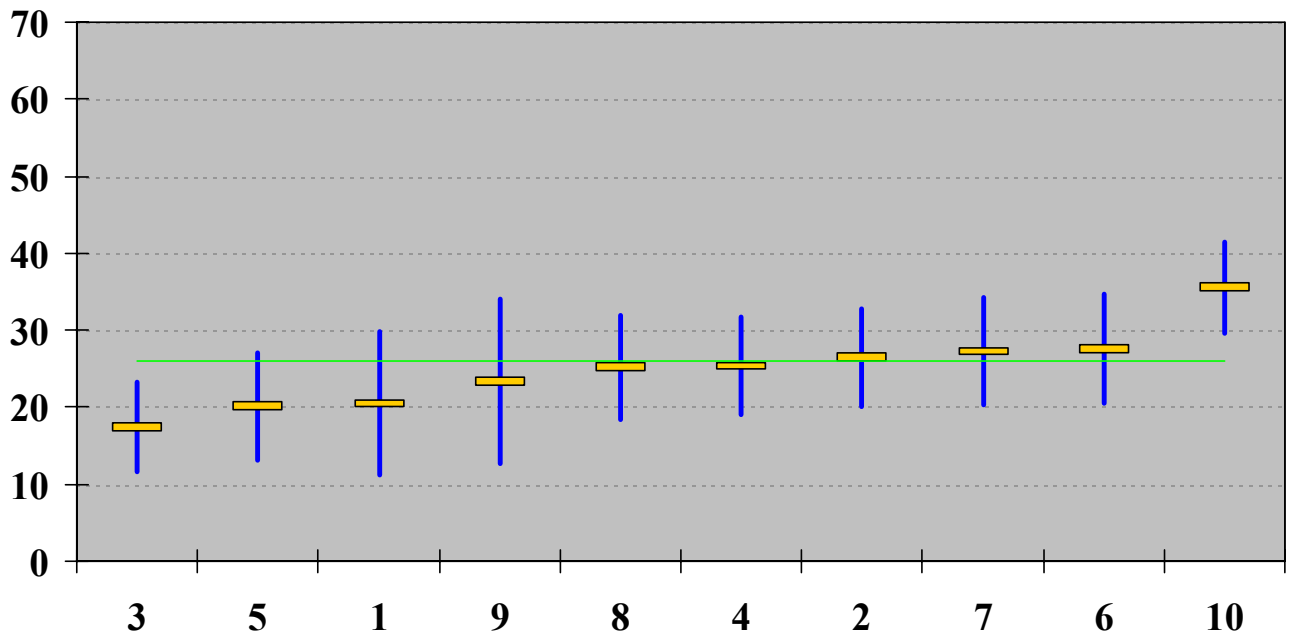
Again, the data can be calculated for the last six years, as shown below. The departments become more centred on the average, and the confidence limits narrows.

### 30 day mortality for operation of Elective Abdominal Aortic Aneurysm 1996 - 2001



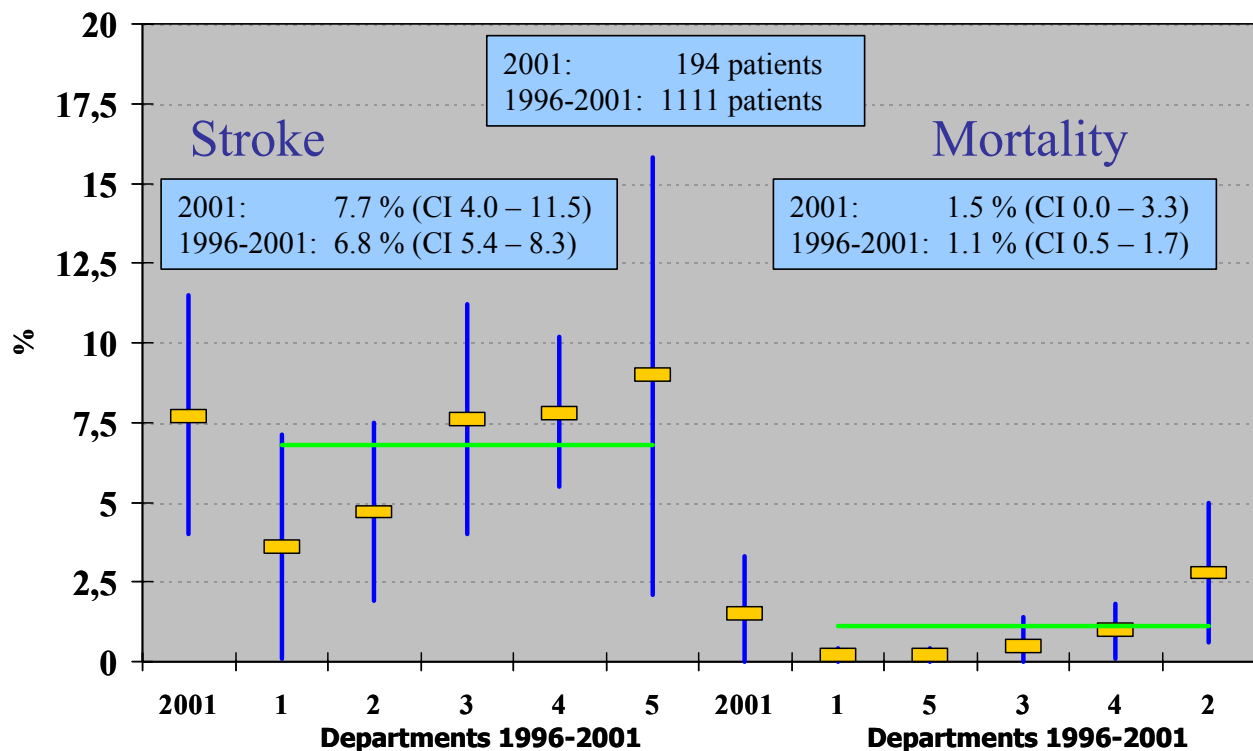
Two departments are seen to have significant lower mortality than the average, which will be subject for an audit, to see if the reason is patient selection, differences in risk factors or better patient handling. The result is expected to be published in next years report.

## General complications of Operation for Elective Aortic Aneurysm 1996-2001



Surgery for AAA cannot be performed without a certain mortality and morbidity, despite the many efforts to reduce it. The general complications illustrated here consist mainly of cardiac, pulmonary and renal complications and stroke.

## In hospital stroke-rate and 30 day Mortality after Carotid Trombendarterectomy (CEA)



Carotid Endarterectomy is performed to prevent embolization to the brain. In Denmark, only symptomatic patients are operated, with previous minor stroke, TIA, Amaurosis Fugax or other focal symptoms. These patients carry a significant higher risk of a major stroke leading to severe paresis or death the first years after a minor incident if not operated.

The figure presents the average stroke-rate and mortality for year 2001, with 95% confidence limits, as the leftmost data in each set. For the years 1996-2001 the result is presented for each of the five departments performing this operation, and the average result marked with a green horizontal line. The number of the department is the same for stroke-rate and mortality.

There is two major randomized studies, that included patients operated for symptomatic carotid stenosis, the American NASCET<sup>3</sup> and the European ECST<sup>4</sup>. Our early stroke-rate in the six-year period was 6,8%, while it was found to be 5.5 % in the NASCET-study and 6.1 % ind the ECST-study. Overall the early stroke-rate is 2.5 times greater than for the non-operated patients, but this difference is corresponded by the long-term preventive effect of surgery, making surgery beneficial for high-grade stenoses<sup>5</sup>. For 30 day mortality the condition is the same, with a Danish rate of 1.1 % in comparison to 1.1 % in NASCET and 1.0 % in ECST. Overall the Danish results for carotid surgery seems satisfactory and at the international level.

### Causes of variation

As it has been stated above, several factors can influence the outcome of the individual patient, and comparison of results from departments (or surgeons) should be made with caution and with adjustment for the most significant risk factors. Some factors are inherent in the patients themselves, and cannot be avoided. Sometimes the risk factors can be (partially) corrected with optimisation of preoperative treatment, or they may, at the least, give rise to a more precise evaluation of the risk for the patient and lead to a better patient selection. Below, this problem has been illustrated with data from 2001. The discussion below is not the most exhaustive of this problem, but only serves as an illustration of its complexity. It should, on the other hand, not lead to pessimism regarding the possibility for publishing relevant and interpretable data. The problems are difficult to solve, but not impossible, and should be approached with well-known, scientific epidemiological methods. The work of validation and scientific interpretation of data should be recognised as equally important, only in this way understandable and relevant reporting be provided to the public.

The examples below first covers the question of *stability of risk-factors over time*, if comparison is made with uncorrected data from year to year. If risk factors is at the same level year after year, this comparison can be made, for each department and nationally. Next the *influence of risk factors on outcome* is illustrated, with the impact of age on mortality as the example. The last examples illustrates the different *age distribution for each of the departments*, showing that there is major differences, thus having an important impact on the interpretation of outcome.

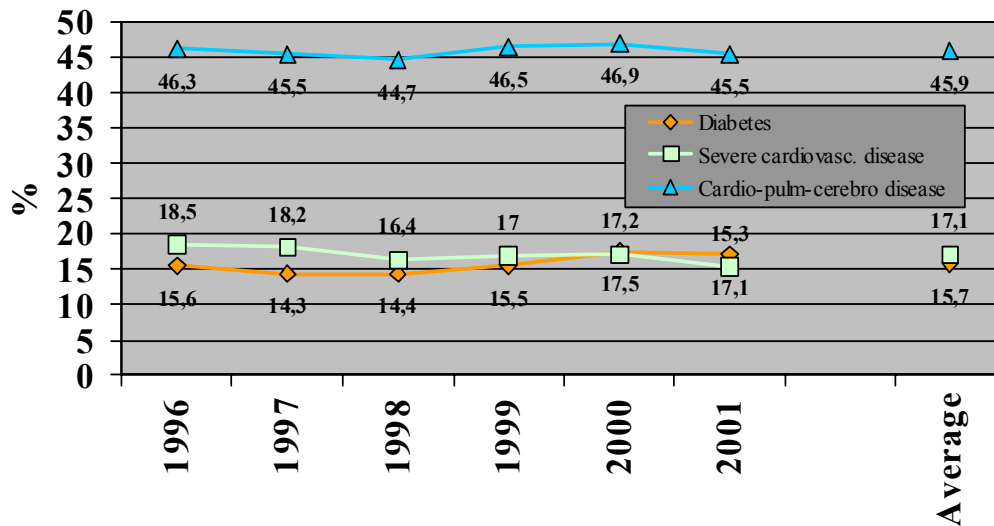
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<sup>3</sup> Ferguson GG et al. The North American Symptomatic Carotid Endarterectomy Trial. Surgical Results in 1415 Patients. Stroke 1999; 30: 9: 1751-8

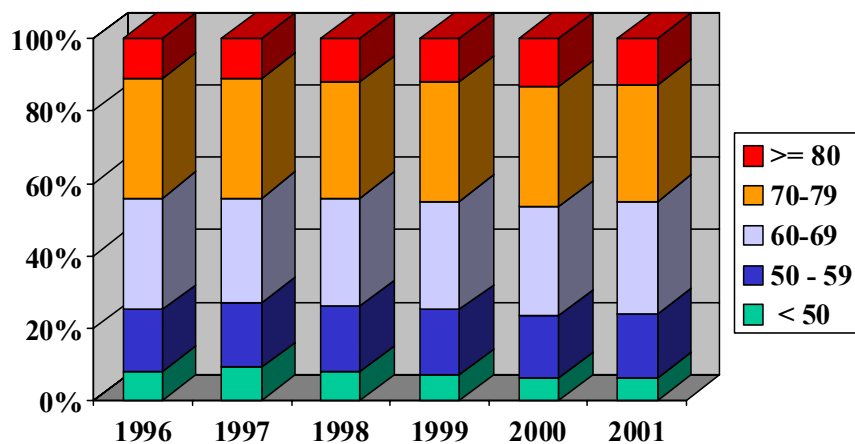
<sup>4</sup> Bond R. et al. Clinical and Radiographic Risk Factors for Operative Stroke and Death in the European Carotid Surgery Trial. Eur J Vasc Endovasc Surg 2002; 23: 108-16

<sup>5</sup> Cina CS et al. Carotic Enderectomy for symptomatic carotid stenosis (Cochrane Review). In the Cochrane library, issue 4, 2002. Oxford: Update Software.

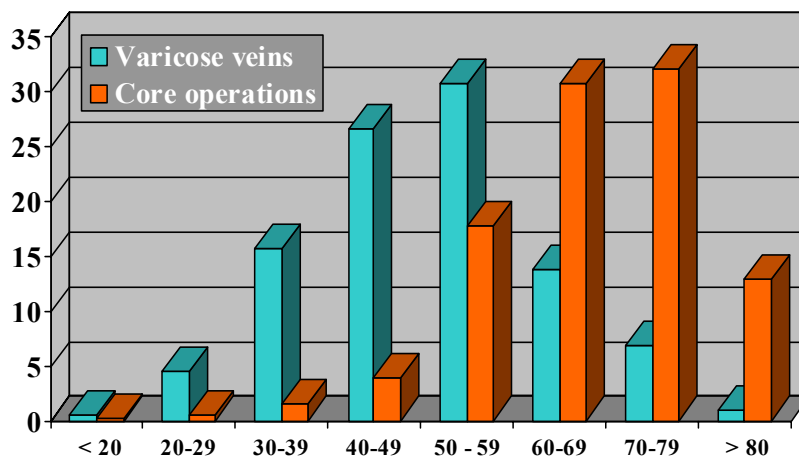
### Variation in risk factors 1996 - 2001



### Variation in age distribution for core operations 1996 - 2001

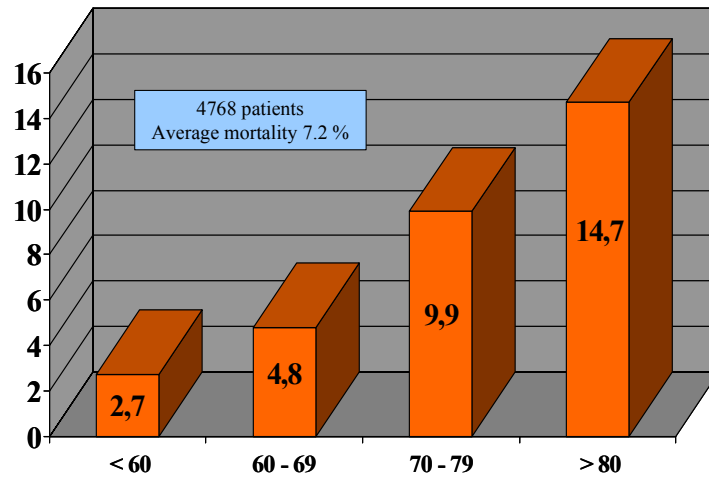


### Variation in age distribution for core operations and varicose veins 2001

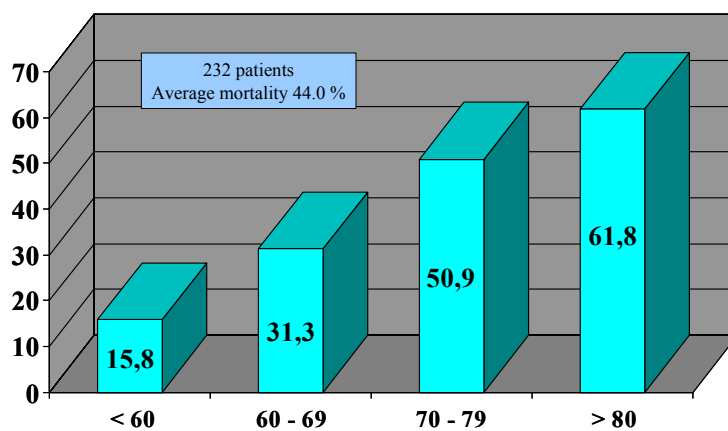


If data is to be reported without case-mix correction, and with comparison of outcome over the years, it is necessary to evaluate if the population has been stable in the period. As seen, no changes are recorded in the distribution of selected risk factors or age composition. However, with the increasing number of operations for varicose veins at several departments, it is necessary to separate those from the core operations, as the age distribution (and risk factors) is significant different.

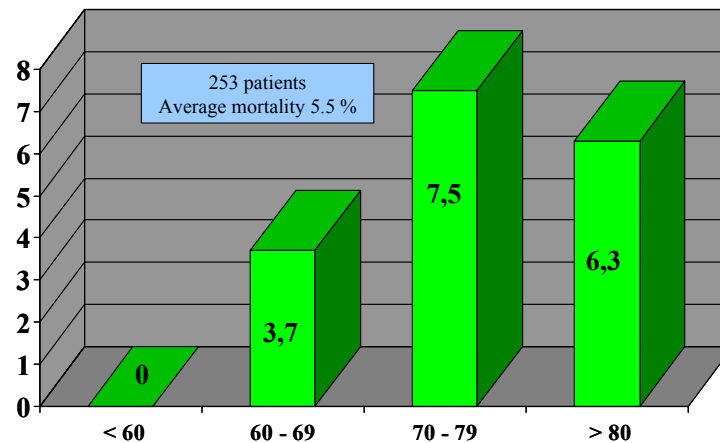
### Mortality and age – all core operations 2001



### Mortality and age – ruptured aneurysms 2001

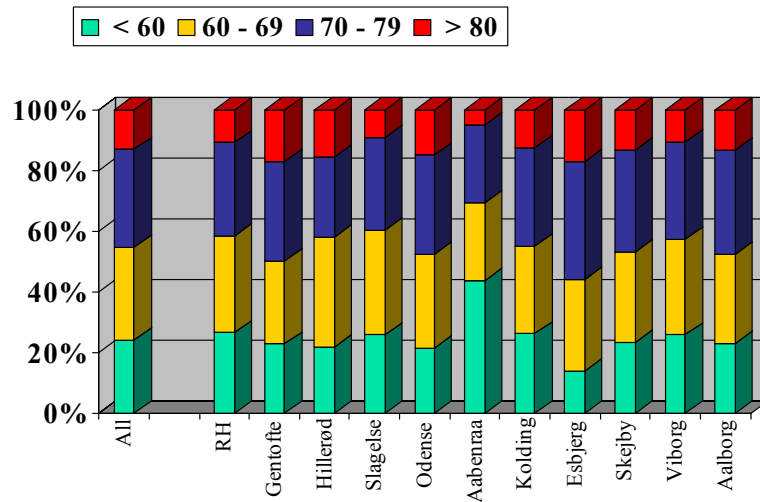


### Mortality and age – elective aneurysms 2001

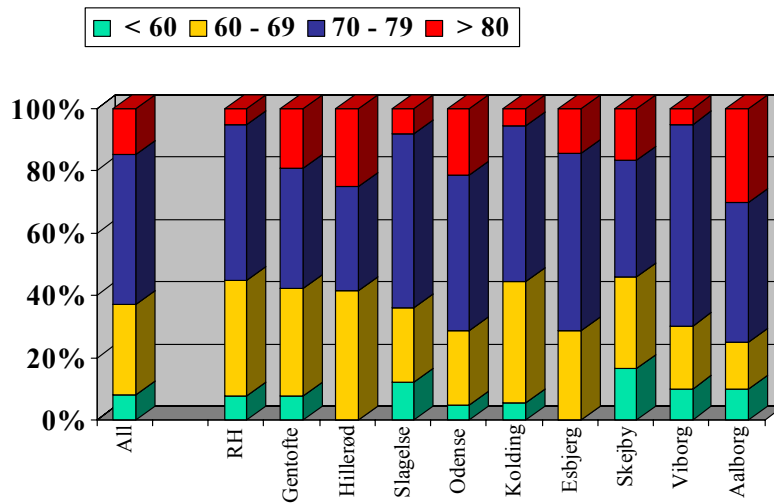


As expected, age plays an important role as a risk factor for death, overall for core-operations, and also in case of operation for ruptured and elective aneurysm. When evaluation the mortality-rate at each department, the age composition at each unit should therefore be taken into consideration, as it may explain some of the differences.

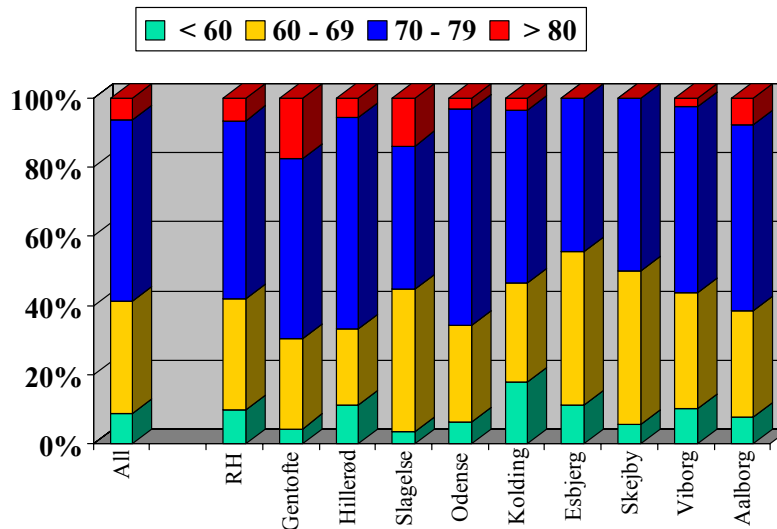
### Age distribution for each department – core operations



### Age distribution for each department – ruptured aneurysms



### Age distribution for each department – elective aneurysms



There are huge differences in age composition, making it necessary to take it into consideration when comparing outcome for the departments.

## MEMBERS AND REPRESENTATIVES OF THE DANISH VASCULAR REGISTRY IN 2001:

Rigshospitalet:	Consultant Jørgen E. Lorentzen
Gentofte:	Consultant Leif Panduro Jensen
Hillerød:	Consultant Ole Michael Nielsen Ph. D.
Slagelse:	Consultant Jørgen Andersen
Odense:	Consultant Ole Røder
Aabenraa:	Consultant Anders Elbirk
Kolding:	Consultant Jørn Jepsen
Esbjerg:	Consultant Thorbjörn Jonung Ph. D.
Århus:	Consultant Jesper Laustsen
Viborg:	Consultant Torben Vestersgaard-Andersen
Aalborg:	Consultant Allan Kornmaaler Hansen

*In 2001, the elected board had the following representatives:*

Leif Panduro Jensen (chairman)  
Jesper Laustsen (secretary)  
Allan Kornmaaler Hansen (Treasurer)  
Ole Røder

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