PRACTICE MANAGEMENT

Peter F. Lawrence, MD, Section Editor

Implementation of the National Health Service Abdominal Aortic Aneurysm Screening Program in England

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The National Health Service Abdominal Aortic Aneurysm Screening Program (NAAASP) has been introduced after research and analysis of data from a number of randomized trials and existing local screening programs in England that showed a reduction in aneurysm-related mortality when men aged ≥65 years were offered ultrasound screening. The evidence was assessed by the United Kingdom National Screening Committee against a set of internationally recognized criteria that confirmed that screening all men aged ≥65 years saves lives. The introduction of abdominal aortic aneurysm (AAA) screening to men aged 65 years is estimated to reduce premature death from ruptured AAAs by up to 50% over the next 10 years. This article describes the AAA screening program in England, its ongoing implementation and current challenges, and outcomes in the first 150,000 men. (J Vasc Surg 2013;57:1440-5.)

In 2005, the United Kingdom (UK) National Screening Committee reviewed the evidence for abdominal aortic aneurysm (AAA) screening in men. In November 2005, it concluded that ultrasound screening should be offered to men in their 65th year, with men aged >65 years being able to self-refer within the National Health Service (NHS). The NHS Abdominal Aortic Aneurysm Screening Program (NAAASP) was announced by the Department of Health in January 2008, and in July 2009, the phased implementation of the program began with screening taking place in six early implementer sites. It is anticipated that by April 2013, the service will be fully operational across England, with ~40 local programs offering aneurysm screening to all men in England in the year they turn 65 (>300,000 new men invited per annum).

EVIDENCE FOR AAA SCREENING

Ruptured AAAs currently cause almost 4000 deaths each year in England and Wales.[1] A number of randomized controlled trials have established that a single abdominal ultrasound scan in elderly men decreases the risk of aneurysm rupture by almost 50% over the next 10 years.[2] Most AAAs detected by screening are below the threshold of 5.5 cm, where the benefits of intervention are not proven over conservative management.[3] These men undergo ultrasound surveillance and receive lifestyle advice that can reduce the growth rate of small AAAs and minimize cardiovascular morbidity. Men with an AAA that enlarges in surveillance to ≥5.5 cm are referred for specialist advice and considered for elective AAA repair.

The largest controlled trial, the Multicentre Aneurysm Screening Study (MASS)[4] showed that a single ultrasound scan in men aged 65 to 74 years significantly reduced the rate of premature death from AAA rupture. Analysis of the 10-year data concluded that the number of lives saved outweighed the number of deaths after elective AAA surgery, although this effect was waning by 13 years after randomization because the number of men with an incidentally detected AAA rose in the control group.[5] A meta-analysis of all randomized screening trials estimated that it was necessary to invite 240 men for AAA screening (with 80% attendance, 192 men scanned) to save one death from rupture. Conversely, for 2080 men invited for screening (1660 scanned), there would be one additional elective surgical death. Over 10 years, for every 10,000 men screened, it was estimated that 52 lives would be saved but with the risk of six deaths after elective surgery.[2]

Screening programs are obliged to inform potential participants of any possible adverse outcomes. AAA screening is not without risk, and the program has a small, but certain risk of death (after elective surgery) for men

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who attend. This is reflected in the standard national information leaflet sent to all men on invitation.

There are other advantages in having a large AAA detected by screening. Postoperative mortality after surgery for men with a screen-detected AAA is lower than in those with AAAs detected incidentally.[6] The reasons for this are not clear but may include decreased comorbidities, aneurysms that are generally smaller, and aneurysms with anatomy more amenable to endovascular repair.

SCREENING PATHWAY

The NAAASP standards are based broadly on evidence from MASS and defined in a standard operating procedure document that outlines how screening should be delivered in all localities, to ensure consistency.[7] Screening is organized through local programs, each covering a minimum population of 800,000, and run by a full-time coordinator, supervised by a program director, who is a local vascular specialist. Each year, local screening program centers receive a list of all men aged 65 in that year in their region from the national IT system, based on data from family physicians. The men are sent a written invitation that includes the standard information leaflet and offers an appointment at a location near their homes. Screening is done by a mobile team in family doctors' offices, NHS premises, or local hospitals.

Screening is undertaken by screening technicians trained to a national standard with classroom-based, E-learning, and on-site skills training that is accredited by the Consortium for the Accreditation of Sonographic Education (CASE) and approved by the Society of Radiographers. The aorta is imaged and the size defined by the internal anteroposterior aortic diameter in the transverse plane, using an average of three measurements. The images are retained for future quality assurance. Men are given their result immediately and their family physician is informed. Further information is immediately available for men with an abnormal aortic scan. Men who fail to attend are sent a reminder by post; if they fail to attend on a second occasion, no further action is taken, but their family physician is informed. The screening process is outlined in Fig 1, from invitation to surveillance and treatment pathways.

IMPLEMENTATION

The NAAASP in England has been implemented over 4 years, in phases (Fig 2). The fourth and final phase of the local programs will be commissioned from October 2012 to April 2013, resulting in planned full coverage of the country for the 2013 to 2014 cohort of men aged 65 years old. Similar programs are also being implemented in Scotland, Wales, and Northern Ireland (although all with separate administration), so that all men in the UK should have equal access to AAA screening. All vascular services that receive men with screen-detected AAAs in England must undergo preimplementation quality assurance to check that they reach standards set by the Vascular Society of Great Britain and Ireland (VSGBI).

UPTAKE AND OUTCOMES

Data from the national NAAASP are held on a bespoke IT system (AAA SMaRT), which contains details of the call and recall database, along with all aspects of the screening pathway and screening outcomes. It links to the VSGBI National Vascular Database, where registration of procedures and outcomes is mandatory for all surgeons treating men in NAAASP.

NAAASP has previously published an annual report on invitations and outcomes for 2009/2010 and 2010/2011. Analyzing summary data from April 1, 2009, to March 31, 2012, 196,744 men were invited for screening, and 157,730 attended (uptake 80.17%; Table). Overall, 1.57% of scans showed AAAs of ≥3 cm. Some 2484 men had a first diagnosis of AAA and were invited to enter the surveillance program. During the first 3 years of the NAAASP, 305 men underwent elective repair of their large AAA (175 open and 130 endovascular repair). Four deaths occurred after elective repair ≤30 days, two in each group (total mortality, 1.31%). One man who had been screened in the program had a ruptured AAA. He survived emergency repair of what was found to be a mycotic aneurysm.

CURRENT ISSUES

NAAASP has a formal structure within the NHS, including a steering group and an advisory group, which is independent of the program. A number of issues have arisen during implementation of the national Program.

Vascular service reviews. When the scientific case was made for AAA screening, results for elective AAA repair were published from countries around Europe (VASCUNET, 2008).[8] Mortality after elective AAA operations in the UK was 7.5%, double the average for the rest of Europe. This was a major concern, because the effectiveness of AAA screening is dependent on the safe management of any AAA detected. The VSGBI agreed on an action plan to set a quality improvement framework consisting of best practice standards for aortic surgery (http://www.vascularsociety.org.uk/library/quality-improvement.html). These were approved by VSGBI membership and used as standards by NAAASP to quality-assure new screening centers.

The standards set meant that smaller vascular units needed to coalesce into networks with a single intervention center, or centralize. The networks are required to have a single site where inpatient and emergency vascular services are undertaken but provide a comprehensive outpatient and day-case service across all the hospitals in the network. This remodelling of vascular services in the UK has reduced to ~75 the number of sites where aortic surgery is undertaken and also improved to 2.4% the 30-day mortality after surgery.[9]

Aortic measurement. NAAASP is predicated on MASS, which used measurement of a static ultrasound image of the aorta obtained in the anteroposterior plane, with a measuring calliper placed on the inner walls of the aortic image, the inner-to-inner (ITI) method. The

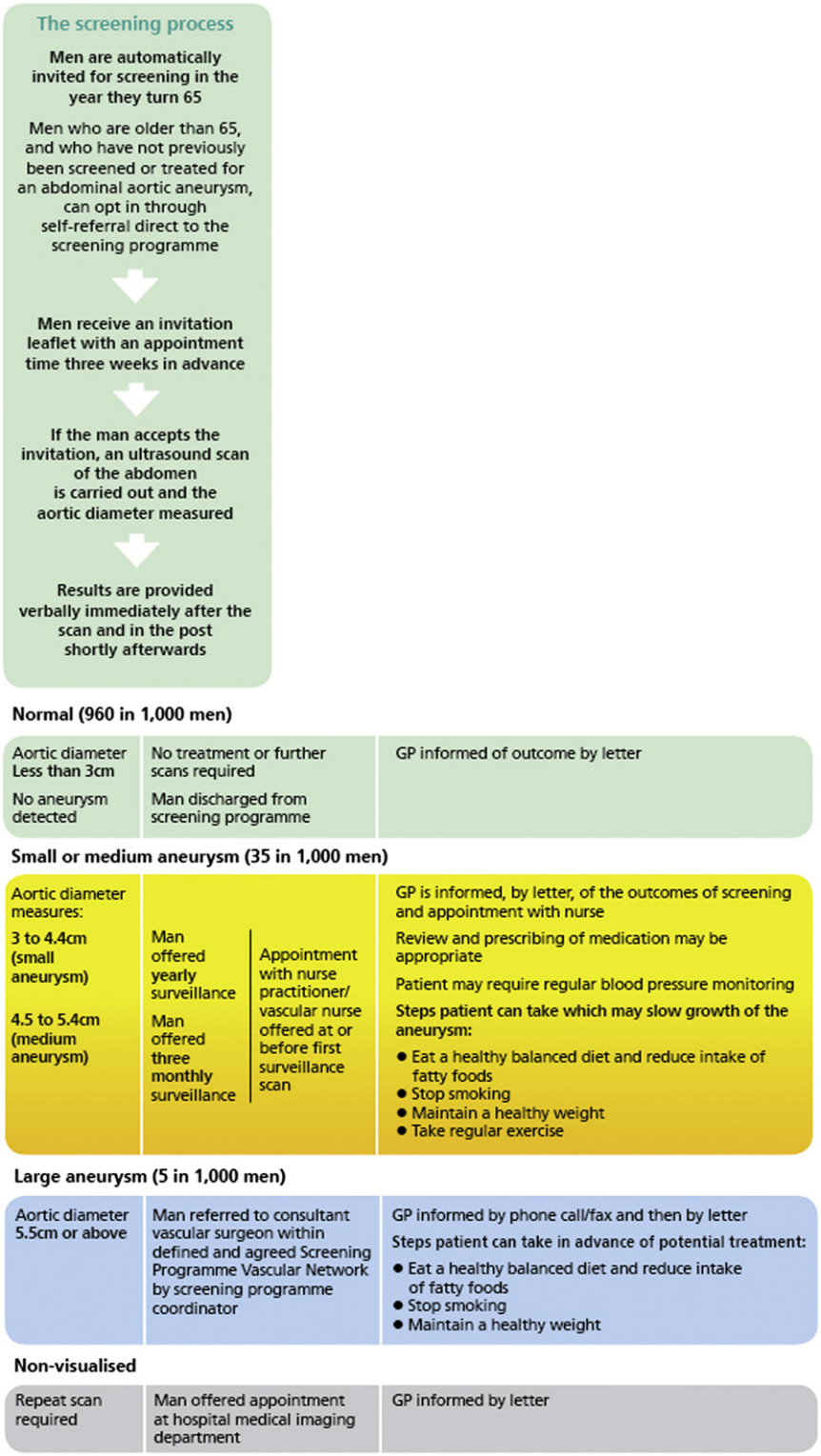

Fig 1. The National Health Service Abdominal Aortic Aneurysm Screening Program (NAAASP) screening process and pathways are shown for the management of men with normal-sized aortas and those with aortic aneurysms. *GP*, General practitioner.

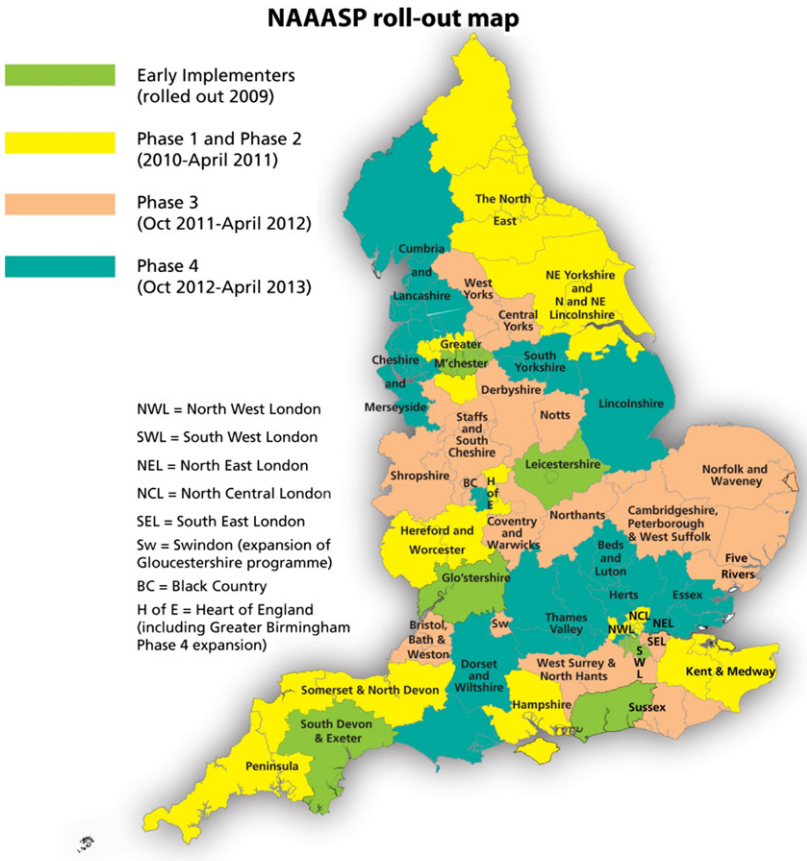

Fig 2. Map shows the rollout plan of the National Health Service Abdominal Aortic Aneurysm Screening Program (*NAAASP*).

Table. National Health Service Abdominal Aortic Aneurysm Screening Program (NAAASP): Initial screening outcomes 2009 to 2012, including annual cohorts plus self-referrals

		Aorta diameter, cm				
Year	*Initial scans, No.*	*<3, No. (%)*	*3-4.4, No. (%)*	*4.5-5.4, No. (%)*	*≥5.5, No. (%)*	*Total ≥3, No. (%)*
2009-10	23,696	23,292 (98.30)	330 (1.39)	30 (0.13)	44 (0.19)	404 (1.70)
2010-11	35,380	34,766 (98.26)	503 (1.42)	66 (0.19)	45 (0.13)	614 (1.74)
2011-12	98,654	97,188 (98.51)	1157 (1.17)	168 (0.17)	141 (0.14)	1466 (1.49)
2009-12	157,730	155,246 (98.43)	1990 (1.26)	264 (0.17)	230 (0.15)	2484 (1.57)

maximum diameter was recorded as the size of the aneurysm. Many vascular laboratories place the callipers on the outer wall of the aorta (outer-to-outer), thus including the thickness of the aorta, which may be several millimeters bigger.

A recent study using NAAASP technicians and more experienced technologists suggested that reliability is greater with ITI.[10] The ITI method gives the lowest possible measurement of aortic diameter, which has implications for screened men whose aortic diameter is measured just <3 cm at the age of 65, who will be reassured and discharged. Another group potentially disadvantaged is men with an aortic diameter of 5.2 to 5.4 cm in surveillance whose referral for surgery may be delayed. Research is ongoing into the implications for these men. It is probably more important that standard methodology is used than which technique is used.

Cost-effectiveness of AAA screening. The epidemiology of AAAs appears to be changing.[1] The prevalence of aortic diameter >29 mm was about 4% in MASS,[4] and

the cost-benefit analysis of screening was calculated using this rate. In the first 3 years of NAAASP, the detection rate was just under 1.6%, although this was effectively based only on a sample of ~40% of the population. In similar contemporary studies from New Zealand,[11] Sweden,[12] and Gloucestershire, UK,[13] the decreasing prevalence of AAAs has also been observed. Perhaps this is not surprising, because there is good evidence of a global reduction in cardiovascular disease in many Western populations, together with the rise in diabetes, which may be protective. Changes in diet and lifestyle, reductions in smoking habits, and general application of preventive treatments for hypertension and hypercholesterolemia are all likely to have contributed.[14] This questions the potential cost-effectiveness of any future national AAA screening programs. The initial calculations done using data from MASS suggested that the incremental cost-effectiveness ratio was £7600/life-year gained, within the accepted range in most modern health systems.[4] Early estimation from England and other European countries is that AAA screening, as presently described, may remain cost-effective, with incidence rates as low as 1%.[15]

There are cost differences between open and endovascular surgery for AAAs. Some men with screen-detected AAAs will have an anatomy that is not suitable for infrarenal bifurcated stent grafts and may require fenestrated or branched devices. This will have significant cost implications for the NHS, both for the surgery and ongoing surveillance after stent graft insertion.

IMPROVING EFFICIENCY

During implementation of NAAASP, there has been intense scrutiny of early results. A number of research groups have made proposals about how AAA screening programs might develop. The reducing prevalence of AAAs at age 65 has led to the suggestion that the age of invitation should be raised to 68 or even 70 years. This would increase yield but would also have the effect of missing some younger men who would die from AAA rupture.

The aortic diameter for entering surveillance (3 cm) is somewhat arbitrary, and mature screening programs have observed that men with an aortic diameter just below 3 cm also have a significant risk of developing a large AAA, although it is not known how many of these would have ruptured without treatment.[16] Men with a subthreshold aorta at 65 (range, 2.5-2.9 cm) are also at increased risk of cardiovascular complications.[17] Potential strategies range from including men with subthreshold aortic diameter in screening surveillance to simply informing them and their family physician that they are at risk, so that medical treatment may be optimized. The increasing amount of data on men with small AAAs under surveillance has enabled calculations of optimal intervals between surveillance scans; a saving here might allow inclusion of men with a subthreshold aortic diameter at no extra overall cost.[18] There is also the complex issue of rescreening and whether repeating an ultrasound scan after 5 or 10 years could increase the yield; recent theoretic modelling suggests this may be cost-effective.[19]

Finally, there remains the charge that only screening men is disadvantageous to women, despite previous research that clearly shows screening women aged 65 to 74 was not cost-effective.[20] There is some evidence that the decline in AAA prevalence is less in women than men.[1] However, the most recent population data from Sweden suggest that AAAs are now rare in nonsmokers, so population screening is inefficient for women.[21]

CONCLUSIONS

NAAASP is a new population-screening program and will continue to evolve. It is noteworthy that to date, there has been a lower prevalence of AAAs in 65-year-old men than expected from the literature and lower than in the AAA screening program in America.[22] A recent publication[5] has suggested that AAA screening will remain cost-effective even at an incidence rate of 1%. A formal updated cost benefit analysis for AAA screening in the UK is currently being undertaken, and it is anticipated that this will help to formulate aneurysm-screening protocols in the future. NAAASP is on target to implement aneurysm screening to all men aged 65 years resident in England by April 2013. In the meantime, a formal decision has been made to adhere to the same protocols and standards during implementation. In the longer term, to be effective, the NAAASP will need to be responsive to research as it emerges.

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Conception and design: MD, MH, JE
Analysis and interpretation: MD, MH, JE
Data collection: MH
Writing the article: MD
Critical revision of the article: MD, MH, JE
Final approval of the article: MD, MH, JE
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