Danish clinical guidelines for examination and treatment of overweight and obese children and adolescents in a pediatric setting

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This guideline by the Obesity Committee within The Danish Paediatric Society has also been approved by the Committees for Endocrinology, Gastroenterology, Cardiology, Neonatology and Nephro-urology within The Danish Paediatric Society, Danish Paediatricians Organization, The Danish Society for Diabetes in Childhood and The Danish Association for the Study of Obesity. The Danish College of General Practitioners supports the referral criteria for pediatric evaluation. November 28, 2014.

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BACKGROUND

Over the past two hundred years, life expectancy in the Western world has steadily increased. Recent projections from American data raise concerns in regards to obesity related complications (1). The projected impact of the obesity epidemic may lead to shorter life expectancies in the current generation of children compared to their parents. Therefore comprehensive action in relation to child obesity intervention is recommended (1).

Traditionally, examination and treatment of obesity has not been prioritized in pediatrics, despite overweight children being at an increased risk of becoming obese adults (2-4). More than one in three obese preschool children remain obese as adults (5). Among obese school children almost half remain overweight, a risk that increases with increasing age (6). The significance of childhood obesity is controversial, yet the incidence of adverse health effects may be underestimated (7) and the full consequences of the obesity epidemic remain to be realized (1, 8). Obese children are three times more likely to have hypertension than normal-weight children (9), and a large retrospective Danish study has shown a convincing association between elevated BMI in childhood (7-13 years) and cardiovascular disease in adulthood (10).

Overweight and obesity are major problems that pediatricians should acknowledge. This is emphasized by the Danish data of schoolchildren aged 6-16 years, showing that overweight and obesity from 1947 to 2003 have increased significantly, particularly among the youngest boys (11). Furthermore, recent data shows an approximately 10% prevalence of overweight and obesity among preschool children (12). In the Funen birth cohort from 2001, the prevalence of obesity in children was 1.9% of the children aged 2.5-3.5 years; 2.5% of those aged 3.5-4.5 years; and 2.5% in the group aged 4.5-5.5 years (12). In Copenhagen in 2007, the prevalence of obesity in 5-8 year old girls and boys was 3.7% and 2.6% respectively, whilst in 14-16 year old girls and boys, it was 4.7% and 4.2% respectively (13). In the 2010 “Schoolchildren Study” comprising a random sample of schools in Denmark 2-3% of the children aged 11, 13 and 15 years were obese based on a BMI calculated from the children’s self-reported height and weight (14).

It may seem discouraging, that a previous Cochrane review has shown no evidence of sustained efficacy with respect to any individual preventive treatment on obesity in children (15). However, based on the latest Cochrane review (16) and in particular recent studies of multidisciplinary intervention with prolonged follow-up in Germany (17, 18) and Denmark (19), there is reason to believe that, multidisciplinary treatment approaches aimed at weight limiting changes entrenched in the child’s family, may cause long term weight loss in children and adolescents. “Julemærkehjemmene” in Denmark have developed strategies in helping children lose weight. The challenge, however, has been to maintain weight loss in the home environment (20), and this may be ensured by increased interdisciplinary cooperation.

STRATEGY

The Obesity Committee of The Danish Pediatric Society (DPS) recommend that obesity in children and adolescents be considered a chronic illness, despite BMI cut-off values not being based on studies assessing the long-term detrimental effects of different degrees of obesity.

We anticipate a paradigm shift where obesity is perceived as a chronic illness, alongside other chronic diseases in Denmark. This is in line with the recent statement from the American Medical Society (AMA), recognizing obesity as a disease (21).

We recommend a multidisciplinary service implemented as a “chronic care model” (standard outpatient services) based on the principle of “best clinical practice” (22), primarily inspired by the
recommendations of the American expert committee (23) and the daily practice of "The Children’s Obesity Clinic" at the Copenhagen University Hospital Holbaek (19). Surveys concordantly indicate that a combination of diet, physical activity and behavior-focused interventions provides the best efficacy (22, 23). In addition, family-based interventions seem to be particularly effective both in the short and long term (16, 24, 25).

According to the Danish Health Care legislation the regions and municipalities are responsible for prevention and treatment regarding health services for children and adolescents. This is stipulated in Act No. 913 from 13/07/2010, which indicates that local authorities are obliged to establish general initiatives or provide individual-based support for obese children and adolescents.

In the pediatric wards, we recommend that teams ideally consisting of pediatricians, clinical dietitians, nurses, psychologists, social workers and physiotherapists are responsible for the treatment of obese children and adolescents. Furthermore, it is recommended that collaborations are established with general practitioners, pediatricians in private practice, sports instructors and organizations in the municipalities or other appropriate municipal services. A multi-disciplinary treatment approach involving various institutions would benefit both the individual child and family, and have positive socioeconomic implications. Municipalities and the primary health care sector should be encouraged to provide broad and differentiated health related initiatives tailored to identify and treat obese children and adolescents at a very early stage, thus reducing the number requiring highly specialized services.

DEFINITIONS
Body Mass Index (BMI) = weight (kg) / [height (m)]² is pivotal for assessing obesity. BMI is a simple and useful tool, and it can be complemented by information from a waist circumference measurement and best clinical judgment.

In accordance with the National Board of Health and The Danish College of General Practitioners (26) we define:

• **Overweight** as a BMI above the 90th percentile for age and sex.

• **Obesity** as a BMI above the 99th percentile for age and sex.

An alternative measure is the isoBMI where the definitions of overweight and obesity for children and adolescent’s current BMI is "correlated" to the adult equivalent. According to this definition:

• **Overweight** is an isoBMI of 25 and above.

• **Obesity** is an isoBMI of 30 and above.

The Danish BMI curves indicating IsoBMI are available (27):

- **Girls**: [http://vækstkurver.dk/PDF/pige_BMI_0_20_aar.pdf](http://vækstkurver.dk/PDF/pige_BMI_0_20_aar.pdf)
- **Boys**: [http://vækstkurver.dk/PDF/dreng_BMI_0_20_aar.pdf](http://vækstkurver.dk/PDF/dreng_BMI_0_20_aar.pdf)

The BMI z-score, which describe a patient’s BMI in relation to the average BMI for a person of the same age and sex [z-score = (current BMI - mean) / standard deviation] is often used internationally. However, the calculation of the BMI z-score requires digitalized direct access to a normal reference material which may prove to be difficult in a clinical everyday setting.

**Children and adolescents should be referred for examination and treatment in a pediatric setting if they have a:**

BMI corresponding to an isoBMI of at least 30 OR BMI corresponding to an isoBMI of 25 to 30 AND one or more of the following features (leading to a suspicion of complex obesity):

• Suspection of a specific medical reason for obesity.

• Dyscrine features.

• Declining rate of growth (height), a relatively short stature.

• Developmental delay.

• Persistent overeating / "binge-eating" and searching for food.

• Rapidly increasing BMI.

• Other complications / associated conditions e.g. hypertension, dyslipidemia, elevated liver enzymes, insulin resistance, pre-diabetes, type 2 diabetes, polycystic ovary syndrome, or obstructive sleep apnea.

• Concurrent family history of two or more of the following diagnoses: type 2 diabetes, hypertension, hyperlipidemia, metabolic syndrome, cardiovascular disease, or obesity.

**HISTORY (28):**

Obtaining a thorough medical history is fundamental, as it provides the basis for any supplementary investigations and aids in the planning of further treatment. We recommend using the structured "overweight-sheet/overvægtsskema" from the Obesity Committee of DPS (Appendix1 – in Danish) to ensure collection of all relevant information. We also recommend interviewing the patient regarding different aspects of life as assessed by the visual analogue scale (VAS) sheet from the Obesity Committee of DPS (Appendix2 and 3 – in Danish):

• Pregnancy, birth information, breastfeeding, and previous growth.

• Predisposition to obesity, hypertension, dyslipidemia, type 2 diabetes, or other cardiovascular diseases.

• Ethnicity / consanguinity with potentially increased risk of complications.

• Headache ((pseudo) tumor cerebri, hypertension), daytime sleepiness, and snoring (sleep apnea).

• Abdominal pain (constipation, psychogenic, gallstones, and fatty liver).

• Pain in the hips / knees / ankles (epiphysiolysis).
• Girls after menarche: menstrual irregularities and/or hirsutism (polycystic ovary syndrome).

• History of diet and exercise is pivotal. We recommend a thorough approach as comprehensive as stated in the overweight sheet (Appendix 1 – in Danish).

• Medications (including: glucocorticoids, psychotropic and thyroid medication).

• Intoxicating substances (tobacco increases insulin resistance and the risk of cardiovascular disease, alcohol may add to the total calorie intake).

• Social history: education, well-being, bullying, family structure and dynamics.

• Sleeping pattern: apnea, the duration of sleep.

• Psychosocial history: depression, low self-esteem, anxiety, and solitude.

**PHYSICAL EXAMINATION INCLUDING PARACLINICAL RESULTS AND SPECIFIC PHENOTYPES (22, 23, 24, 28, 29):**

**Physical examination:**

• Height and weight to calculate BMI (and BMI changes prospectively).

• Waist circumference (also for the assessment of treatment outcome). It should be measured midway between the lower part of the ribs and the upper part of the hipbone. Preferentially, the waist circumference is measured in the same way every time (30, 31).

• Previous growth data plotted on the height-weight curves [http://www.vækstkurver.dk/](http://www.vækstkurver.dk/). The expected target height according to the child’s genetic potential is calculated:

  Girls: the average of the parental height in cm subtracted 6.5 cm.

  Boys: the average of the parental height in cm added 6.5 cm

  - Is the patient growing according to the "target level"/genetic potential?

  - Most children with "simple" obesity have a height above their target percentile and an advanced bone age.

  - Low actual height for target height combined with overweight/obesity should warrant considering a more specific assessment: syndromic, chromosomal and endocrinological evaluation.

• Pubertal evaluation a.m. Tanner, including assessment of potential virilization in girls.

• Measurement of blood pressure according to the Danish consensus report on hypertension in children (appropriate cuff size, sitting with support beneath the feet or lying preceded by a minimum of 5 minutes of rest, measuring the blood pressure at least 3 times, until there is a maximum of 5 mm Hg difference between the latest two measurements). If the first measurement shows an elevated blood pressure it is recommended to measure the blood pressure more times and use a mercury sphygmomanometer and/or ambulant blood pressure monitoring depending on individual assessment.

  [http://www.laeger.dk/portal/pls/portal/IPORTAL.wwpob_page.show?_docname=9796971.PDF](http://www.laeger.dk/portal/pls/portal/IPORTAL.wwpob_page.show?_docname=9796971.PDF)

  • Neurological examination with focus on pathology in/near hypothalamus.

  • Examination for acanthosis nigricans especially in the neck, armpits and inguinal (often associated with hyperinsulinemia).

  • Examination for striae.

**Paraclinical investigation:**

1) Blood samples (fasting when possible):

• Thyroid function (TSH, fT4, fT3), HbA1c, blood glucose, insulin.

• Red/white blood cell count. Calcium metabolism markers (vitamin D, PTH, ionized calcium, phosphate, albumin). Lipids (total cholesterol and fractions, triglycerides). Liver function tests (Alanine transaminase, alkaline phosphatase, bilirubin, gamma-glutamyl transferase). Urate, creatinine, urea, Na and K.

• If a non-fasting patient has pathological values in lipid/glucose metabolism, repeat fasting samples are required.

2) Medical imaging:

• DEXA scans (ideally), alternative bio-impedance to assess body fat.

**Special findings/phenotypes warranting further investigation:**

• Syndromic obesity: Karyotyping, genetic testing for Prader Willi Syndrome, etc. If monogenic obesity is suspected: adapted genetic evaluation regarding MC4R (melanocortin 4 receptor), leptin receptor and other potential “obesogenic” genetic variations.

• Arterial hypertension: The patient should be evaluated and treated as other patients with arterial hypertension. [http://www.laeger.dk/portal/pls/portal/IPORTAL.wwpob_page.show?_docname=9796971.PDF](http://www.laeger.dk/portal/pls/portal/IPORTAL.wwpob_page.show?_docname=9796971.PDF)

• Vitamin D deficiency: The patient should be evaluated and treated as other patients with vitamin D deficiency. [http://www.paediatri.dk/images/pdf_filer/dps_vejl/013ge.pdf](http://www.paediatri.dk/images/pdf_filer/dps_vejl/013ge.pdf)

• For patients with a pre-diabetic phenotype (HbA1c of 5.7 to 6.4% (39-47 mmol /mol) or repeated fasting blood glucose levels at 5.6 to 6.9 mmol /l or oral glucose tolerance test with glucose levels of 7.8 to 11.0 mmol /l after 2 hours): Refer to a department with a diabetes section for children and adolescents for further investigation, follow-up and decision making regarding potential treatment [http://www.dsbd.dk/instrukser/t2dm](http://www.dsbd.dk/instrukser/t2dm)

• Suspicion of precocious puberty: standard local guidelines.
• Delayed pubertal development: standard local guidelines

• Hirsutism or irregular menstruation: 17-OH-progesterone, testosterone, estradiol, LH, FSH, ultrasound of the ovaries and uterus for potential polycystic ovary syndrome (32).

• If non-alcoholic hepatic steatosis (fatty liver) is suspected: Optimally MR spectroscopy, otherwise abdominal ultrasound of the liver (risk of inter-observer variation).

• Asthma or other respiratory symptoms: Spirometry or alternative pulmonary function test.

• Suspected sleep apnea: Evaluation by a skilled sleep laboratory.

• Pain or restriction of motion in the lower extremities: conventional x-ray of the knee and/or hip joint. Consider referral to a pediatric orthopedic surgeon.

• Rapidly developed/evolving obesity: consider measuring prolactin, ACTH, morning cortisol, and urinary cortisol (optimally x 3), and MRI of the brain.

• If the scores on life conditions on the VAS scale are low: consider contacting the school, a social worker, psychologist, etc.

• In case of explicit social problems/severe challenges regarding compliance: consider contacting social services.

TREATMENT (16, 22, 23, 24, 25, 33):
Successful treatment is fully dependent on the effort comprising the entire family. The overall message is that the family, as a whole should support initiatives and be involved in the treatment including adherence to the same dietary advice as the patient.

Obesity is rarely caused by an underlying endocrinological or other well-defined medical cause. The main principle of the treatment is therefore to reduce caloric intake (not necessarily smaller amounts of food, but more fiber containing and "greener" food) while increasing the physical activity (i.e. decreasing inactivity):

1 Diet (reducing caloric intake):

a) Advice regarding individual meals:

• 4-5 (6) meals a day, which should provide moderate satiety throughout the day.

• Breakfast should be consumed every morning. It may consist of whole grain products (bread) with low-fat cold cuts, oatmeal, whole grain cereals, eggs and low-fat milk.

• Lunch: Whole grain bread with low-fat cold cuts and vegetables.

• Between main meals: Whole grain products (bread, oatmeal, etc.), vegetables. Cold cuts preferably low-fat (optimally 6% fat: 6 gram fat/100 gram of product). The Danish “keyhole label” is for products with maximum 10% fat (10 gram fat/100 gram of product).

• Dinner: Meals should be served in restricted portions according to the T-model or “healthy plate model” as illustrated in Figure 1. The meal may be preceded by the intake of a large glass of water. Preferably only one serving. After consuming the first portion, the child should wait at least 20 minutes before a second serving is considered.

Figure 1: T-plate model (healthy plate model)

b) General advice with food intake:

• Bread and pasta should always be whole grain variants. White bread should be avoided.

• No butter or spread on the bread. It is recommended that butter is removed from the household.

• Lean cold cuts with max 6% fat.

• Fibers corresponding to the fiber 5+ gram rule (minimal intake of fibers in grams per day = age + 5) (33).

• Vegetables/salads may be consumed in large amounts (attention to abdominal pain due to large fiber load).

• Maximum two fruit servings a day for example one apple and one piece of watermelon.

• Intake of fluids should be covered by water and half a liter of skimmed milk a day. It is recommended that soft drinks are removed from the household. Replacement with “light products” is unsuitable as it maintains the desire and need for "sweetness".

• Fast-food maximum once a month.

• Candy and other sweets maximum once a week and in very limited quantities.

• Do not eat in front of TV/PC/PlayStation/etc.
2) Activity/Exercise (increasing energy consumption/reducing inactivity):

- Maximum two hours daily of screen time (TV, PC, mobile phone etc.), besides school work. This restriction is age dependent (younger children should be restricted to an even shorter screen time).

- Time monitoring, for example a mobile phone can advantageously be used as a tool to enable screen time compliance.

- If not related to school assignments, time in front of TV or PC should be omitted prior to 5 p.m.

- At least one hour of exercise every day (should generate significant rise in pulse/sweating. Every session should last at least 20 minutes).

- Team sports should be encouraged. Some sports traditionally are more accessible when it comes to the inclusion of obese children (e.g. American football, volleyball and handball).

- Daily transportation to/from school should be by foot/bike, if this doesn’t pose a traffic-related danger.

- Many families gain from using pedometers that may be acquired for reasonable sums in sports shops and pharmacies. Children should walk at least 10,000 steps per day depending on age.

3) Sleep:

- No screen time after bedtime (when the child goes to bed, it is recommended that the TV and the computer is turned off and the mobile phone is silenced).

- Age-appropriate bedtime and hours of sleeping (34, 35).

4) Tobacco and alcohol:

- A complete smoking cessation should be encouraged. Children, young people and parents smoking should be offered relevant counseling for tobacco cessation

- Children and young people under the age of 16 should not drink alcohol. Young people above the age of 16 are recommended to drink as little alcohol as possible and not to exceed 5 units on the same occasion. These are the recommendations by the Danish National Board of Health https://sundhedsstyrelsen.dk/en/health/alcohol

5) Pharmacotherapy and surgery:

- Pharmacotherapy is rarely indicated. Effective products are scarce and there is currently no consensus for pharmaceutical treatment.

- There is generally no indication for obesity surgery in children.

REFERENCES:


Overvægtsskema, Adipositasudvalget, Dansk Pædiatrisk Selskab

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Medicin under graviditeten ____________________________________________________________
Rygning under graviditeten ____________________________________________________________

Tobak, Mor Ryger; ja___ antal pr. dag:_____ nej__

hvis nej: Har tidligere røget fast? Ja__ nej__

Tobak, Far Ryger; ja___ antal pr. dag:_____ nej__

hvis nej: Har tidligere røget fast? Ja__ nej__

Tidl. GA: ____ +____ FV: ___________ g. FL: ___________ cm.

graviditet og fødsel: ________________________________________________________________

Debut overvægt (ca. alder)____
Højde og vægt, helst 5 år eller mere retrospektivt (oplysninger fra skole, læge m.v.)

Dato_________________________ Højde__________cm Vægt______________kg
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Aktuelt

Kost, typisk (evt. de sidste to dage):
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Grøntsager:  Nej_____   Ja____, antal gange pr. uge:___________
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Frugt:          antal frugtportioner pr. dag ______
Portionsstørrelser (aften): Lille_______  Mellem______  Stor______  Antal_______
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Saftvand:____pr. uge                Kakao:____pr. uge                Energidrikke:____pr. uge
Mælk: glas/liter pr. dag_____________ Skummet___ Mini___ Let___ Sød____

Spiseforstyrrelse
  Trøstespiser ja___ nej___ Overspiser ja___ nej___
  Springer måltider over ja___ nej___ Hurtigspiser ja___ nej___
  Kræsen ja___ nej___ Hvordan kræsen___________________________________________
  Tidligere kræsen ja___ nej___ Hvordan kræsen___________________________________________

Fysisk aktivitet:
  a. Sportsgren: __________________________ timer/uge
     (f.eks. aerobic, boksning, basketball, badminton, cykling, dans, fodbold, fægtning,
      gymnastik, håndbold, ishockey, karate, løb, ridning, svømning, tennis, volley)
  b. Andet (trampolin, leg, løb og dans hjemme)__________timer/uge
  c. Cykler til skole: Ja___ nej___ Går til skole Ja___ Nej___ = ______timer/uge
  **Total timer pr. uge**______(a+b+c)

Inaktivitet
  Kør til skole  Ja___ Nej___
  TV/PC/Gameboy mm: Timer pr. dag _______ Timer før kl. 17_________

Søvn
  Sengetid til hverdag__________ Op til hverdag_______________________________
  Sover afbrudt Nej_____ ja______ Afbrudt af ________________________________

Medicin
  Nej___ ja___, hvilken________________________________________________________

Tobak
  Ryger; ja___ antal pr. dag:____ nej___
  hvis nej: Har du roget tidligere? Ja___ nej___

Alkohol
  nej___ ja___ hvis ja: antal genstande per uge:_____

Sosialt:
  Søskende: /
  Bor hos: Mor og Far_______ Mor_____ Far_____
  Skolegang: ja___ nej___ Specialklasse ja___ nej___
  Mobning: ja____ nej____, Bliver du holdt udenfor: ja____ nej____
  Har du vænnet dig til mobning: ja___ nej___ Er du ensom ja___ nej___
  VAS-skema (livsglæde, livskvalitet, appetit, mobning, kropsopfattelse)
Obj: 

Vægt: kg  Højde: cm
Liv: cm  Hofte: cm
BT (1): BT(2): BT(3):

Tanner, Pige B (bryst)____ Tanner, Pige P (pubesbehåring)_____
Menarche: ja___ (dato)____ nej____
Tanner, Dreng G (genital)____ Tanner, Dreng P (pubesbehåring)_____
Testis: Højre____ml  Venstre____ml

Acanthosis Nigricans: nej____ ja____
Stria: nej____ ja____ , hvor;

Plan:

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18:________________________________________________________________________
19:________________________________________________________________________
20:________________________________________________________________________
Livsglæde

0 ______________________ 10

Livskvalitet

0 ______________________ 10

Appetit

0 ______________________ 10

Mobning

0 ______________________ 10

Motivation

0 ______________________ 10

Krops-opfattelse

0 ______________________ 10

Adipositasudvalget, Dansk Pædiatrisk Selskab
Livsforhold vurderes efter VAS skala. Adipositasudvalget, DPS

Livsglæde, humør
Nu skal du prøve at beskrive dit humør, hvor 10 beskriver “i strålende humør” og 0 beskriver “virkelig ked af det”, - hvor på skalaen befinder du dig?

Livskvalitet
Prøv at beskriv, hvordan du synes dit liv er, hvor og 10 er ”det bedst mulige liv” og 0 er ”det værst mulige liv”, - hvor på skalaen befinder du dig?

Appetit
Prøv at beskrive din appetit. 10 beskriver at du har en ”voldsom appetit og kan spise hele tiden” og 0 er at du har en ”lille appetit og har ikke lyst til at spise ret meget”?

Mobning
Mobning er at blive holdt uden for, drillet, slået eller generet på en væmmelig måde.
Nu skal du beskrive, om og hvor meget du har oplevet mobning: hvis du beskriver 10, ”bliver du mobbet meget” og beskriver du 0 ”bliver du ikke mobbet”?

Motivation
På en skala fra 0 til 10 skal du beskrive, hvor motiveret er du for at tabe dig? Ved 10 ”vil du gøre alt for at tabe dig” og ved 0 ”er du ligeglad med, om du taber dig”?

Kropsopfattelse
Beskriv hvordan du har det med din krop, hvornår 10 beskriver, at du har det ”godt med din krop”, og 0 beskriver, at du har det ”dårligt med din krop”?

Visual analog skala

Formål
Visuel Analog Skala eller Visual Analogue Scale er et redskab, der blandt andet kan vise smerteintensitet og ændringer i denne. Formålet med smertevurderingen med VAS er at få patienten til at angive sit smerteniveau. VAS kan gradueret et smertesvar. Flere målinger, der foretages over en tidsperiode, kan vise, om der er sket en ændring i patientens smerteoplevelse.

Ændringen kan både vises på langt sigt (før og efter behandling), altså hvad der er sket med patientens smerteintensitet over en længere periode, men VAS kan også anvendes til at vise smerteaendringer på kort sigt, f.eks. inden for en given behandlingsseance.

Beskrivelse
VAS er en linje med markeringer (anker-ord) ved enderne. Oftest bruges betegnelserne ”ingen smerte” og ”værst tænkelig smerte” som anker-ord. Der bør ikke være placeret ord over eller under skalaen.

VAS findes i to versioner: Klassisk VAS er en 100 mm lang streng på et stykke papir. Patienten angiver sin smerte ved at sætte et mærke på strengen, VAS scores ved at måle længden i mm fra ingen smerte til patientens mærke. Mekanisk VAS (M-VAS) er en smertelineal, hvor patienten flytter en skyder, der angiver smerteniveau. Flere medicinavlverproducenter udleverer en M-VAS som reklame. I litteraturen er forskellen på M-VAS og klassisk VAS belyst, og der er ikke fundet forskel på de to forskellige metoder.