Table 20. Candidate gene association studies for pelvic organ prolapse.

Gene	refSNP ID	Pheno-typing	Authors	Population	n cases	n controls	Allelic Test OR(95% CI)	Power OR>=2	Hardy-Weinberg	Other Notes
COLIA1	rs1800012	POPQ	Skorupski et al 2006 [767]	White Polish	37	40	1.39(0.61-3.15)	42.7%	Deviation from HWE for controls p<0.05	
	rs1800012	POPQ	Rodrigues et al 2008 [769]	Brazilian	107	209	1.38(0.89-21.5)	92.5%	In HWE	High risk population stratification
	rs1800012	POPQ	Feiner et al 2009 [770]	White Israeli or Ashkenazi	36	36	1.4(0.55-3.56)	31.6%	In HWE	High risk population stratification
	rs1800012	POPQ	Cho et al 2009 [771]	Korean	15	15	1(Not calculable)	0%	In HWE	MAF=0% among popn
COL3A1	rs1800255	POPQ	Martins et al 2011 [772]	Brazilian	107	209	0.91(0.61-1.36)	91.6%	In HWE	High risk population stratification
	rs1800255	POPQ	Jeon et al 2009 [773]	Korean	36	36	3.24(1.51-6.94)	26.6%	In HWE	
	rs1800255	POPQ	Kluivers et al 2009 [774]	Dutch	202	102	1.46(1.00-2.13)	86.7%	In HWE	High risk population stratification
	rs1800255	POPQ	Chen et al 2008 [775]	Taiwanese	84	147	1.22(0.77-1.93)	50.3%	Deviation for cases (p<0.05)	Likely genotyping error
	rs1801184						0.47(0.19-1.10)		Deviation for controls (p<0.005) cases (p<0.05), and population (p<0.001)	
LOX-L1	rs1048661	POPQ	Ferrell et al 2009 [776]	Caucasian and African American US	137	141	1.34(0.94 -1.90)	82.3%	Not calculable	High risk population stratification
LAMC1	rs10911193	POPQ	Fu et al 2009 [777]	Unselected US	61	32	1.18(0.53-2.59)	40.4%	Not calculable	High risk population stratification
	rs10911193	POPQ	Chen et al 2010 [778]	Caucasian US	102	163	1.12(0.65-1.96)	74.8%	Not calculable	
	rs20563						0.85(0.60-1.21)			
							0.75(0.53-1.07)			
				African American US	63	83	0.55(0.19-1.64)	32.5%		
	rs20558						1.28(0.79-2.06)			
							1.29(0.80-2.09)			
MMP1	rs2071230	POPQ	Romero et al 2008 [779]	White US	36	36	0.78(0.28-2.0)	12.2%	Deviation only for controls at rs738789 p<0.001	
MMP2	rs7201						1.26(0.64-2.45)			
MMP3	rs679620						0.57(0.29-1.11)			
MMP8	rs35866072						0.27(0.05-1.32)			

Table 20. Candidate gene association studies for pelvic organ prolapse (continued)

Gene	refSNP ID	Pheno-typing	Authors	Population	n cases	n controls	Allelic Test OR(95% CI)	Power OR>=2	Hardy-Weinberg	Other Notes
MMP9	rs17576						0.94(0.46-1.89)			
MMP10	rs17435959						<0.74(0-0.74)			
MMP11	rs738789						0.58(0.13-2.53)			
TIMP1	rs4898						0.76(0.39-1.45)			
TIMP3	rs2016293						0.60(0.31-1.17)			
MMP3	rs3025058	POPQ	Skorupski et al 2010[763]	Polish	126	132	1.04(0.73-1.47)	32.8%	Deviation <0.05 for controls and <0.001 for cases and popn	Likely genotyping errors
MMP 1	rs1799750				149	109	0.94(0.67-1.33)	33.1%	Deviation <0.05 for cases controls and <0.005 for popn	
MMP1	rs1144393	POPQ	Campeau et al 2011 [780]	US	23	18	0.27(0.08-0.97)	6.7%	Not calculable but stated as in HWE	8 SNPs tested in total but negative results not reported
	rs498186				19	16	6.61(1.13-38.7)	3.1%		
	rs473509				20	21	0.24(0.07-0.85)	6.4%		
MMP1	rs1799750	POPQ	Vishwajit et al 2009 [765]	Unselected US	12	8	1.66(0.46-6.00)	10.5%	Deviation from HWE for cases (<0.05)	No distinction between SUI and POP
MMP9	rs3918242	POPQ	Chen et al 2010 [781]	Taiwanese	92	152	0.80(0.43-1.47)	71.1%	In HWE	Likely genotyping errors
	rs17576						0.62(0.40-0.98)	75.7%	Deviation for controls <0.001	
	rs2250889						1.56(0.98-2.49)	72.6%	Deviation for controls <0.05	
ESR1	rs17847075	POPQ	Chen et al 2008 [782]	Taiwanese	88	153	1.11(0.75-1.63)	67.4%	Deviation for cases alone at rs2228480 (p<0.05)	
	rs2207647						1.02(0.69-1.50)			
	rs2234693						0.97(0.66-1.42)			
	rs3798577						0.90(0.62-1.31)			
	rs2228480						1.47(0.94-2.29)			
ESR2	rs2987983	POPQ	Chen et al 2008 [783]	Taiwanese	69	141	1.20(0.77-1.85)	19.4%	In HWE	
	rs1271572						1.32(0.84-2.08)			
	rs944459						1.25(0.82-1.90)			
	rs1256049						1.28(0.84-1.94)			
	rs1255998						1.31(0.86-1.99)			
PGR	rs500760	POPQ	Chen et al 2009 [784]	Taiwanese	87	150	0.96(0.61-1.52)	53.7%	In HWE	Likely genotyping error
	rs484389						2.02(1.15-3.54)		Deviation for controls (p<0.0001) and cases (p<0.05) and population (p<0.05)	

deviation from Hardy-Weinberg Equilibrium for controls, or both cases and controls, highly suggestive either of genotyping error, or problems with population stratification. In addition to the high risk of bias introduced, these studies are all underpowered other than for extremely large genetic effects, and in most cases fail to account for multiple comparisons in their primary analyses.

Despite this multiplicity of methodological problems, there remains tentative evidence of replicated effects for two different polymorphisms. The rs1800012 polymorphism of collagen type I alpha1 (COLIA1), has been associated with a two-fold increased prevalence of stress incontinence in separate European populations [758,767]. The rs4994 polymorphism of the beta 3 adrenoceptor (ADRB3) has been associated with almost 2.5 fold increased risk of overactive bladder in separate studies of Japanese and Brazilian samples [30,31]. Other polymorphisms tested in more than one study include rs6313 in the 5-HT2A receptor, and rs1799750 in matrix metalloproteinase-1. In each case there are however inconsistent findings, with a high risk of genotyping error, and or population stratification.

Candidate gene studies for prolapse are at an equally nascent stage. Here polymorphisms have been tested in COLIA1, COL3A1, LOX-L1, LAMC, MMPs 1, 2, 3, 8, 9, 10, 11, TIMP1, TIMP3, ESR, and PGR. In comparison to incontinence, investigators have used the POPQ system as standard. However, other methodological problems are common. We again found many underpowered studies, frequent significant deviation from Hardy-Weinberg Equilibrium, and many instances of failure to consider the impact of population stratification in samples. Although many of the primary studies report significant results, our reanalysis suggests that there are no consistently replicated associations in any populations.

With these disappointing results in mind we can consider findings from the first reported genome wide association study in this area. The discovery cohort comprised 115 familial cases of prolapse identified as having had surgical treatment (and frequently also stress or urgency incontinence treatment) with 2,976 controls. In the discovery cohort 6 individual SNPs approached or exceeded genome wide significance ($p<=5x10-8$), but in Manhattan and Regional Association Plots no evidence was seen to support a wider associated locus. Correspondingly, after correction for multiple comparisons none of the 6 SNPs (rs1455311 rs1036819 rs430794 rs8027714 rs1810636 rs2236479) were successfully replicated in a sample of 76 Dutch familial cases. Given the failure of the candidate gene approach, genome-wide association studies are urgently needed, but will require much larger samples of cases for reliable identification of significant loci.

VI. SUMMARY POINTS

Family studies and twin studies have provided convincing evidence of genetic predisposition to incontinence and prolapse, with genetic variation contributing up to half of population phenotypic variability in elderly women. Despite a large research effort, the candidate gene approach has not produced consistent results. Only the rs1800012 polymorphism of collagen type I alpha1 (COLIA1), and the rs4994 polymorphism of the beta 3 adrenoceptor (ADRB3) have been replicated. Despite an urgent need for genome-wide association studies to discover susceptibility genes for these conditions, initial results from the genome-wide approach have been fruitless. Future progress will likely be made through collaboration between large scale population based cohorts phenotyped for these conditions.

I. EPIDEMIOLOGY OF ANAL INCONTINENCE

I. GENERAL COMMENTS AND DEFINITIONS

Faecal Incontinence (FI) is the involuntary loss of faeces – solid or liquid. Anal Incontinence (AI) includes these events as well as the involuntary loss of flatus, which is felt by many patients to be an equally disabling disorder.

The discussion below will therefore focus on the broader definition: AI. A third cause of soiling or embarrassment is anal mucoid seepage, a troubling condition that cannot be deferred by an able sphincter and intact cognition, most often caused by an organic colonic disease or dietary sensitivity, and more rarely by faecal impaction. This is the loss of fluid, sometimes faeculent, often following a normal continent defaecation. This is an important condition to distinguish from other manifestations of incontinence because most authors that report very high prevalence rates of AI include leakage in their questionnaires and thus may include these individuals with this very common symptom. However in these individuals there is often no detectable sphincter abnormality [786]. It is not treatable by any of the standard therapies for incontinence of faeces: such as sphincter repair, neuromuscular re-education or even faecal diversion. It is in fact why we wear underclothes. Not really true for women.

1. ASCERTAINMENT OF ANAL INCONTINENCE

Older reports of AI prevalence have come from single institutions, and the patients described therein have been subject to referral bias when demographics and aetiology are discussed. The accuracy of AI

prevalence estimates may also be diminished by difficulty in ascertaining those figures due to the common underreporting of AI and patients' reluctance to report symptoms or to seek treatment [787-788]. It has been shown that women are more willing to report AI than men [789] In addition, the character (incontinence of solid faeces, diarrhoea, or flatus, or merely anal seepage) and frequency (daily versus episodic) of reported AI varies greatly in each report, and indeed between individuals. So, prevalence depends heavily on the definition of AI.

The variation in prevalence of AI seen in a sampling of surveys in **Table 21** further demonstrates how difficult the ascertainment of AI is. The border between occasional dyschezia which may be associated with minor illness, travel or diet and a disabling disease that requires intervention to return a patient to acceptable function is not clearly drawn. Many questionnaires have been developed and "validated" for the detection of AI, at least three published since the last update of this book. No systematic review of these many questionnaires has yet to be published. The most insightful of prevalence studies has recently been published from New Zealand [790]. The authors studied adults, not excluding those in custodial care. Acknowledging the difficulty in prevalence estimation, they used three different questionnaires: the first simply asking if the participant had incontinence and if they were troubled by it, the second a well known quantitative instrument and the third a quality of life instrument specific to faecal incontinence. In the cohort examined there were those who were totally continent, those that exceeded thresholds in all three instruments and were incontinent and those who had positive responses on only one or two of the questionnaires (**Figure 11**). The authors surmised the two out of three positive responses constituted clinical AI, though the threshold for the quality of life instrument was very high (i.e. perhaps too sensitive). From **Figure 11** it can be seen that the prevalence of AI varied from 12.6% to 26.8% for each individual instrument, 4.6% were positive for all three and 13.2% were positive for two of three, which was the authors' definition of AI.

2. DATA SOURCES AND LEVEL OF EVIDENCE

Since ICI 4 new studies were sought using Medline and EMBASE using the search terms faecal, faecal, anal, incontinence, epidemiology. In addition systematic reviews were specifically sought in Medline, EMBASE and the Cochrane Library.

II. PREVALENCE

Because therapeutic interventions are not the subject of this chapter, and so the epidemiology is descriptive and not derived from randomised clinical trials (aside from the antenatal intervention described below), the level of evidence will be at best 2, and the strongest evidence will come from systematic reviews in which there was a predefined search strategy and application of quality assessment tools that were designed specifically to minimize bias in referral or ascertainment.

Table 21. Population-based Surveys of Prevalence of Anal Incontinence

COUNTRY (ref)	POPULATION	N	PREVALENCE
U.K. [788]	Community Service	4 844	1.9%
France [808]	All >45 years	1 100	11%, 6% to faeces, 60% are women
U.S.A. [806]	Market mailing	5 430	7% soiling, 0.7% to faeces
U.S.A. [789]	Wisconsin households	6 959	2.2%, 63% women
Australia [805]	Household survey	3 010	6.8% in men, 10.9% in women, >age 15
Germany [811]	>18 years	500	4.4%-6.7% (by health)
Australia [810]	>18 years	618	11-20% (gender M>F)
Australia [482]	>18 years	651	11.3%
New Zealand [814]	>18 years old	717	8.1% for solid and higher for gas
U.K. [815]	>40 years	10 116	1.4%
U.K. [816]	Postpartum women	549	5.5%
Canada [817]	Postpartum women	949	3.1% solid, 25.5% flatus
Denmark [818]	Postpartum women	1 726	8.6% in past year, 0.6% to solid stool
Nigeria [819]	Gynecology patients	3 963	6.9%, 2.3% to solid stool
United Arab Emirates [820]	Women multips	450	11.3%, 5.5% to solid stool
Canada [821]	Teenage females	228	3.5% flatus, 3% FI
Czech Republic [822]	Gynecology patients	2 212	5.6%, 4.4% in the community
Japan [823]	Cystectomy patients	28	60.7% post ureterosigmoidostomy
Sweden [824]	Prostate cancer	864	RR 1.3-4.5
Australia [825]	Diabetics	8 657	Increased risk
Holland [826]	Women >60 years	719	4.2% to 16.9% with rising age
U.S.A. [827]	>65 years at home	328	3.7% (M >F)
Japan [828]	>65 years at home	1 405	6.6-8.7% (by age).
U.S.A. [829]	>50 years	1 440	11.1 – 15.2% (F > M)
U.K. [830]	>65 years at home	2 818	3%
Holland [831]	>60 years	3 345	6%, (M = F)
Czech Republic [832]	Nursing homes	1 162	54.4%
U.S.A. [833]	Nursing homes	18 170	47% FI
Canada [834]	Nursing homes	447	46% FI, 44% both UI and FI
France [835]	>18 years	713	30% response rate. 11% gas,0.4% feces, Women>men.
U.S.A. [836]	Women >20 years	2 800	53% response rate. Median age onset 55 years.
France [837]	Women >50 years	2 640	85% response rate. 9.5% FI, but includes leakage.
USA [838]	Women >25 years	4 10	337% response rate. 25% AI. Obesity.

1. ADULTS

In an effort to resolve the widely varying reported prevalence figures (**Table 21**) two systematic reviews of the published frequencies have been reported of community dwelling adults (above age 15 in the second). A summary frequency was not calculated in the first because of the marked clinical heterogeneity between reports. The three reports that the authors judged most free of potential biases had frequencies between 11% and 15%, although only one of these three used a validated assessment instrument [791]. The degree of disability present in these 11%-15% is not known, nor even if a portion of them had only anal seepage. These high prevalences were obtained in surveys that employed anonymous self-administered questionnaires, which may not allow objective confirmation of AI or assessment of degree of disability associated with AI. The second systematic review found a range of solid and liquid anal incontinence of 0-15.2%, with an average across both genders and all age groups of 4.3% [462]. The prevalence in a more recent and rigorous study is discussed above under Ascertainment [790].

2. CHILDREN

The reported prevalence of AI in children can be broadly divided into two facets: in those children born with congenital anomalies of the anus and rectum – either congenital aganglionosis (Hirschprung's Disease) or imperforate anus – and those children without congenital anomalies. Among those children and adults who were born with defects, despite surgical correction of the defect, life long defaecation difficulties are common, occurring in roughly half of affected children [792-794]. Problems with psychological health and development because of the defaecation disorder is also common in this group, as is a generally depressed quality of life [795]. These disorders are not horribly rare, occurring in 3 to 5 per 10,000 live births [796].

Among children without congenital defects of the anal canal, bowel control has been found to be complete in one Swiss cohort in 33% by age 1 year, 75% by age two and 97% by age three. Nevertheless in this longitudinal study, a quarter of the boys and one tenth of the girls had a major period of incomplete bowel or bladder control between the ages of 6 and 18. At least annual encopresis occurred in 2-3% of these children, boys more frequently than girls [797]. In the Wisconsin Family Health Survey the prevalence of AI in children from the ages of 5 and 16 years was 12/1367 (0.88%) with the gender distribution being 7 boys and 5 girls (Wisconsin Family Health Survey: unpublished data). The common disorder for all children and then adults in this discussion is faecal retention with overflow.

III. INCIDENCE

Clinical trials have provided incidence data after a therapeutic intervention, but usually without a preliminary continence assessment. This is best seen in two Cochrane reviews of therapy for anal fissure

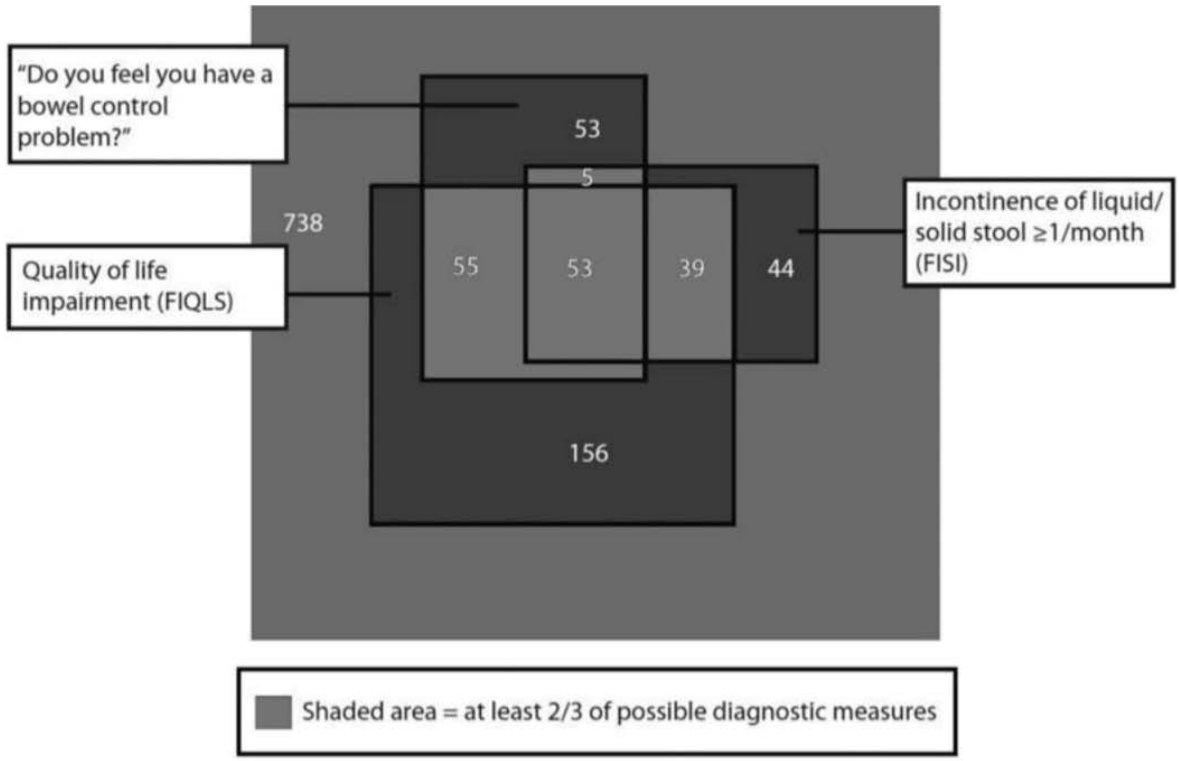


Figure 11. Co-occurrence of fecal incontinence in each of 3 diagnostic measures. FISI = Fecal Incontinence Severirty Index; FIQLS = Fecal Incontinence Quality of Life Scale

[798-799]. AI incidence rates varied widely from 0% to 30%, to flatus only, and the duration was unspecified in the trials. Medical therapy was less likely than surgery to cause AI (0.23, 0.02-2.1), and certain operations (anal stretch) were more likely to cause AI than others (sphincterotomy) (4.2, 1.9-9.4). None of these trials reported rigorous ascertainment of continence before the onset of disease or therapy.

IV. RISK FACTORS

1. AGE

Two systematic reviews have analyses of the association of age and anal incontinence and found age to be the most significant of all assessed associations [800-801].

2. GENDER

Most discussions of the aetiology of AI have been based upon the assumption that women, particularly for individuals under the age of 65 years, are far more at risk for AI than men. Injury to the pudendal nerve or sphincter muscle from prior obstetric trauma is described as the primary risk factor [802-804], followed by irritable bowel syndrome (a disease thought to be more prevalent in women) [805], and other aetiologies such as diabetes a distant third [806]. Yet each population based-survey of the prevalence of AI has shown a surprisingly high prevalence in males (**Table 21**) [788-789, 807-838].

Of the two systematic reviews that looked specifically at prevalence, only one assessed the role gender played and in that review gender was not associated with incontinence in any age group [800]. In the search for this updated review, 26 publications assessed prevalence of AI, two in both genders and 24 only in women. Clearly, aetiologies other than childbirth must be sought. This represents a rather gross imbalance in research on this topic.

3. OBESITY

Four reports have demonstrated an increased risk of AI in obese women, a Kaiser cohort, a cross sectional survey in a specialty clinic and two case control studies [839-842]. One longitudinal study found a reduction in anal leakage (again not necessarily a direct correlate with incontinence) in women after bariatric surgery and weight loss, though other factors including diet and activity change may have been responsible for the improvement [843].

4. CHILDBIRTH AND MODE OF DELIVERY

A meta-analysis of published reports that assessed anal sphincter integrity after vaginal delivery and correlated this with continence stated that 77%-83% (depending on parity) of anal incontinence in parous women was due to sphincter disruption [844]. Another systematic review that looked only at post partum factors in prospective cohorts found that the only predictor of AI was 3rd-4th degree sphincter rupture during birth [845]. Three things are implied by the conclusion or the first review: first, that incontinence in men, children, of elderly onset (or even in middle aged women) and in nulliparous

women, or women having Caesarean section has a completely different cause than in women who have ever delivered vaginally. There is scant epidemiological evidence that this is the case [846]. Second, it is implied that sphincter repair would be effective

treatment for anal incontinence in almost all parous women. Yet repair of disrupted sphincter has less than a perfect track record. Even more importantly, there is a reported rapid decay in function after repair that is far too great to be explained by age alone [847-854]. Third, if direct trauma to the anal sphincter (and not intra-pelvic nerves) were the major cause of anal incontinence, then Caesarean section should beeffective in preventing incontinence. However a systematic review has shown that this is not the case [801] (**Figure 12**). Twenty-one reports have been found eligible for inclusion in the review, encompassing 31,198 women having had 6,028 Caesarean deliveries and 25,170 vaginal births as index events prior to anal continence assessment. Only one of these reports demonstrated a significant benefit of Caesarean section in the preservation of anal continence. In that report AI rates exceeded 39% in both groups, suggesting a problem with ascertainment. The greater the quality of the report, the closer its Odds ration approached 1.0. Among the seven reports that passed all quality criteria (age adjustment, parity adjustment, no previous vaginal delivery in the Caesarean section group, continence assessment more than 4 months post partum) the odds ratio for faecal incontinence was 0.98 (0.79-1.21. **Figure 12**). In reports that allowed comparison of vaginal delivery with elective Caesarean section there was also no significant difference in AI risk (OR=0.73; 0.52-1.03. **Figure 13**) There was no difference incontinence preservation in women have emergency versus elective Caesarean section (OR= 1.09; 0.89-1.34. **Figure 14**). Among the seven best studies, the NNT is 339, i.e. 339 Caesarean sections would have to be performed to prevent a single case of faecal incontinence. Pregnancy with delivery of any kind was found to be only a marginal risk factor for faecal incontinence (OR= 0.86; 0.73-1.01. **Figure 15**) though there is significant statistical heterogeneity in this analysis (p=0.05, I2=62%). In another publication increasing parity as an isolated risk factor does increase risk of AI [838].

But why doesn't Caesarean section prevent anal incontinence, especially when associating perineal trauma with loss of bowel control is not just intuitive, but sometimes visibly obvious? Certain aspects of vaginal delivery are clearly causally related to anal

incontinence: significant laceration, forceps, and some episiotomies [855-856]. However this review demonstrates that other factors need to be explored. So one must look to pregnancy and not just labour and delivery as an initiating factor. Further evidence in favour of this comes from the sphincter repair literature cited above. The rapid decay in function suggests that another defect is present besides a gap in the sphincter that remains after the early effects of sphincter repair wear off. What this is, is not yet known, doesn't make sense although trauma at the pelvic inlet during pregnancy or in early labour [857] seems likely. Sphincter dysfunction has been demonstrated in women who have had Caesarean section [858]. Further indirect evidence for the possibility that injury higher in the pelvis may be related to AI in pregnant women can be found in the association between hysterectomy and AI, an association seen more prominently with abdominal hysterectomy (TAH) than vaginal hysterectomy (VH), and for flatus only [859] (Odds Ratio of TAH vs. VH for faeces: 1.2, 0.3-4.7, Odds Ratio for gas: 18.9, 1.1-327). Pelvic nerve injury during surgery is the postulated reason for this difference.

5. NURSING HOME RESIDENCE

The most prominent association with AI by far is nursing home residence. Whereas the prevalence of AI is probably around 2% to 5% for community-dwelling persons, and may rise with increasing age to greater than 10%, among nursing home residents the prevalence approaches 50% [832-834]. This is partly explained by FI being one of the most common reasons for nursing home admission. In a large survey of 18,000 Wisconsin nursing home residents, risk factors for faecal incontinence (FI) were directly observed by nursing home personnel [833]. Urinary incontinence (UI) was the greatest association with FI (OR = 12.6, 11.5-13.7), followed by the loss of ability to perform daily living activities (6.0, 4.7-7.7), tube feeding (7.6, 5.6-10.4), physical restraints (3.2, 4.7-7.7), diarrhoea (3.3, 2.7-4.2), dementia (1.5, 1.4-1.7), impaired vision (1.5, 1.4-1.7), constipation (1.4, 1.3- 1.6), faecal impaction (1.5, 1.1-2.1), stroke (1.3, 1.2- 1.5) male gender (1.2, 1.1-1.3), age and body mass index. Inverse associations were noted with heart disease, arthritis and depression.

6. DIARRHOEA

The importance of diarrhoea of liquid stool in FI cannot be overemphasised [842]. One case series noted that 51% of individuals with chronic diarrhoea were incontinent [787]. In the Wisconsin Family Health Survey of AI [789], 10 of the 25 subjects with FI lived in Milwaukee when the city experienced an outbreak of waterborne disease [860]. Non-infectious causes of diarrhoea must also be considered, such as inflammatory bowel disease [861] and those initiated by sports activities such as running [862-863].

7. SURGERY

AI originating from surgery would seem fairly insignificant in the general population, since previous anal surgery has not been an apparent risk factor in the larger surveys. Several operations nonetheless can frequently result in AI. Examples are midline internal sphincterotomy, lateral internal sphincterotomy, fistulectomy, fistulotomy, ileo-anal reservoir reconstruction, low anterior rectal resection, total abdominal colectomy, and

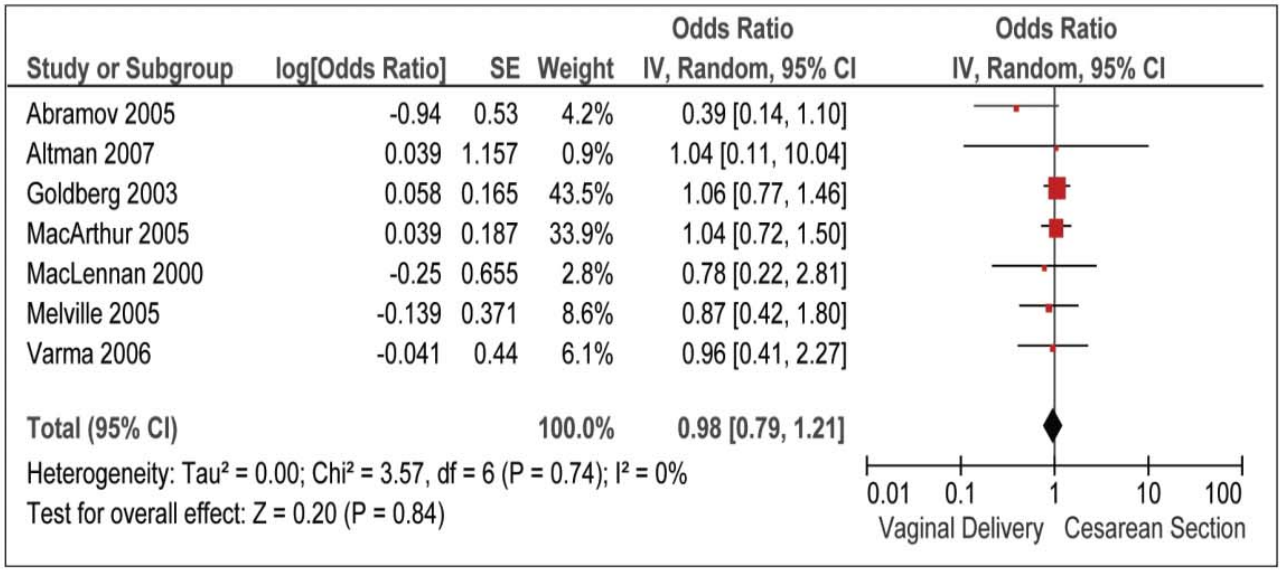


Figure 12. Systematic review of Efficacy of Cesarean Section in Preventing Faecal Incontinence: 7 Studies fulfilling all quality criteria

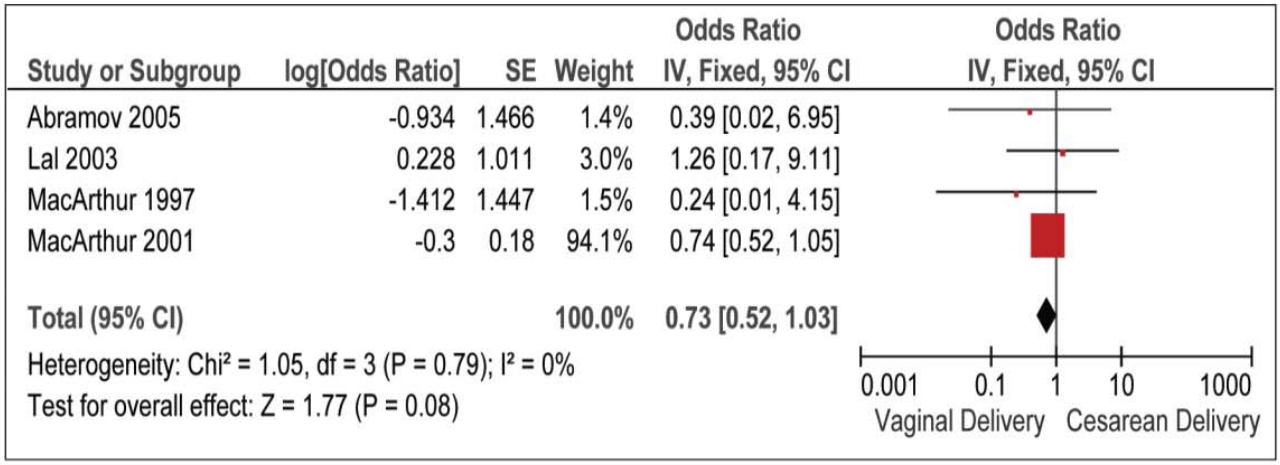


Figure 13. Systematic review of Efficacy of Cesarean Section in Preventing Faecal Incontinence: Vaginal Delivery versus Elective Cesarean Section

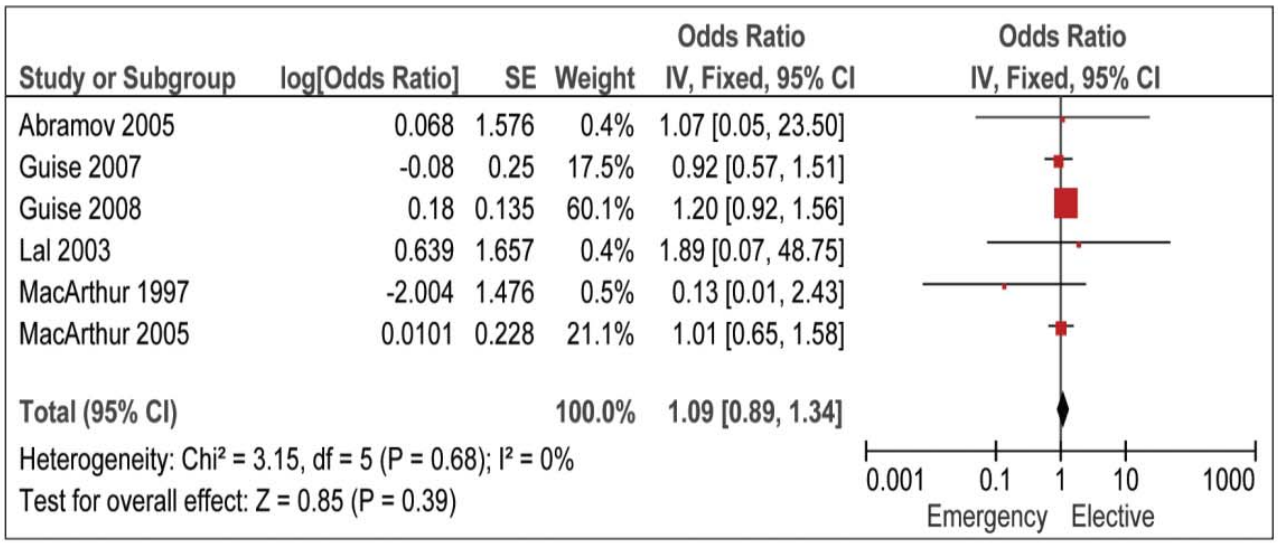


Figure 14. Systematic review of Efficacy of Cesarean Section in Preventing Faecal Incontinence: Elective vs. Emergency Cesarean Section

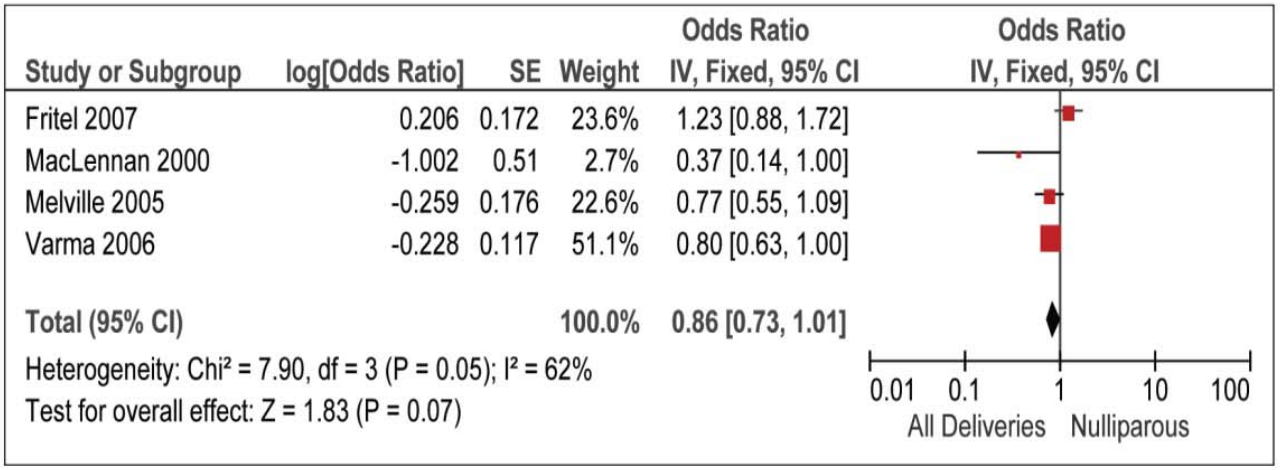


Figure 15. Systematic review of Efficacy of Cesarean Section in Preventing Faecal Incontinence: Nulliparous women versus Any Form of Delivery

ureterosigmoidostomy. The risk of lateral internal sphincterotomy for anal fissure causing AI was previously thought to be insignificant when compared to midline sphincterotomy, but a recent reappraisal of this operation has shown an AI risk may be 8% [864]. The risk of AI after fistulotomy has been reported to be as high as 18% to 52% [865]. New approaches to fissure and fistula have recently been developed specifically to lower this risk [865-866]. However incontinence after haemorrhoidectomy has also been reported to be as high as 33%, an operation in which no sphincter is divided [867]. This suggests either that division of the anoderm, not the sphincter may be affecting continence, or that the method of ascertainment used in published surveys is not accurate. Mixing urine and stool has been found to have a predictable effect on anal sphincter control, as does diarrhoea, in patients having uretero-sigmoidostomy after urinary bladder resection [823]. Patients with rectal cancer form a special group in whom cancer issues often mute the continence disturbance that may result from rectal resection [868] or radiotherapy [869].

8. SPECIFIC NEUROLOGICAL AND OTHER DISEASES

Several specific diseases have been anecdotally associated with AI in case series, and mechanisms to explain the associations have been investigated [870]. Examples are diabetes [825], stroke [871-872], multiple sclerosis, Parkinson's disease, systemic sclerosis, myotonic dystrophy, amyloidosis, spinal cord injury, imperforate anus, Hirschsprung's disease, retarded or interrupted toilet training, procidentia, and any illness causing diarrhoea (HIV, IBD, radiation, infection). Many of these conditions directly affect patient mobility and ability to perform daily living activities or they cause diarrhoea or faecal impaction.

9. CONSTIPATION

Constipation may alternate with diarrhoea in irritable bowel syndrome making defaecation chaotic and often very urgent. Just as often retained faeces lead to anal seepage that cannot be held. In the New Zealand survey [790], the 2 of 3 rule for categorising an individual as incontinent excluded constipated patients, which was also assessed in their survey, the positive rate fell from 13.2% to just over 9%. This further demonstrates the frequent co-existence of constipation and AI, similar to the frequent coexistence of urinary incontinence and AI.

10. COHORTS INITIATED BEFORE CLINICAL AI ASSESSED FOR SUBSEQUENT DEVELOPOMENT OF AI

Because of a paucity of clinical trials that specifically address risk factors and prevention of AI, the strongest available data to identify risk come from cohorts that collected data on potential risk factors prior to the onset of incontinence. Prospectively collected risk assessments for FI have occurred in three nursing home cohorts. Porell combined UI and FI into a single outcome variable and found many positive associations in a cohort of 60,000 nursing home residents in Massachusetts [873]. Age, African American race, cognitive and ADL impairments, predicted the outcome, although specific relative risks for incidence are not presented. Chassange followed 234 previously non-FI residents in France for 10 months, during which 20% had FI episodes, but only 7.5% developed long lasting FI [874]. The others had acute episodes due to diarrhoea or impaction. The factors associated with the development of long lasting FI were urinary incontinence (UI) (2.9, 1.8-4.6), decreased mobility (1.8, 1.1-3.0), and cognitive defects: either as seen in an MMSE score <15 (2.5,1.4-4.4) on history of dementia (2.1, 1.2-3.5). Neither gender nor age were risk factors. Nelson reported, in a cohort of 18,000 nursing home residents in Wisconsin, a subgroup of 3,850 continent of both urine and faeces in 1992 who were assessed one year later [875]. 15% developed FI. Positive associations were seen for ADL loss (3.4, 2.4-4.5), trunk restraints (2.5, 1.7-3.6), dementia (1.7, 1.4-2.0), African American race (2.1, 1.3-3.4) and age (1.02, 1.0-1.0). UI was not investigated as a risk factor because it was felt to be a co-morbid condition. In a broadly based cross sectional survey, it was apparent that factors that affect an individual's general health or physical capabilities, independent of age and gender, place that individual at greatest risk for AI [805], though all four are significantly associated with AI [789]. Among obstetric patients age has also been a consistent association, with less consistent associations noted for chronic bronchitis (OR =6.5, 1.1-38), symptoms of pelvic organ prolapse (5.0, 3.0-8.7) and obesity (3.0, 1.0-3.4) [876]. Defaecatory dysfunction has also been assessed in antenatal women [877-879], found to be prevalent which has led to an important preventive strategy for post partum AI described below.

V. PREVENTION

This discussion is by necessity descriptive, so preventive measures are only relevant insofar as they provide insight into the aetiology of incontinence. By far the most frequently applied preventive measure is Caesarean delivery, discussed above. Its lack of effectiveness in preventing anal incontinence provides a valuable insight into the relationship between pregnancy and AI – that the focus may need to be more on the pregnancy rather than the delivery and how it

affects defaecation afterwards. A decision analysis study suggests specific obstetric indication for elective C. section that may be cost effective [880]. Another study related to birth trauma randomised mothers to immediate post-partum anal ultrasound with repair of occult defects in the sphincter and continence assessed in follow-up, demonstrating an improved outcome with this intervention [881]. Antenatal intervention with pelvic floor exercises has been assessed in a number of randomised trials [882-883] for the purpose of diminishing post partum AI. One Cochrane review found this strategy effective [882]. Sixteen studies were included in the analysis in which 6,181 women participated. Those without prior urinary incontinence were randomised to either pelvic floor training or standard care. At 12 months postpartum the intervention group were half as likely to have AI (RR= 0.52; 0.31-0.87). A subsequent report has not shown this benefit, and has yet to be included in the Cochrane review [883].

The AHRQ recently published a monograph on the prevention of incontinence, although the strategies listed for AI were therapies for existing AI, such as pelvic floor exercises and retraining, rather than stablished mechanisms for prevention [884].

VI. SUMMARY POINTS

- Anal and urinary incontinence commonly coexist, particularly in the elderly and in nursing home residents (LE 1).
- The prevalence of anal incontinence increases with age, but is present in all age groups and both genders varying from 1.5% in children to more than 50% in nursing home residents (LE1).
- AI is almost as common in men as in women (LE 2).
- Mode of delivery does not seem to be a significant factor in the development of obstetric anal incontinence, i.e., AI develops after Caesarean delivery as often as after vaginal delivery (LE 2).
- Obesity is perhaps the most modifiable risk factor for AI (LE 2). Intrapartum pelvic floor education can decrease the risk of subsequent development of post partum AI (LE 1).
- As populations age, co-morbid disease becomes a significant component of faecal incontinence risk. Surgery, neurological diseases, and stroke are examples.
- Cognitive and ADL impairment are associated with faecal incontinence.
- More population based prevalence surveys have been published.
- More analyses comparing AI after Caesarean section and vaginal delivery have been published.
- Systematic reviews of prevalence, including the role of age and gender, Caesarean delivery and decision analyses for the application of Caesarean delivery in macrosomia have been published, providing needed aggregation of data with quality assessment of existing literature.

VII. FUTURE NEEDS

- Risk factors for AI in each age group are still poorly defined.
- Prevention research, much less policy, are therefore still a great distance away.
- Randomised trials are needed of AI (and UI) in average risk women comparing vaginal delivery and Cesarean section.

J. WHY DO PREVALENCE ESTIMATES DIFFER?

The discussion here relates to UI only, as data and literature for FI and POP are very scarce. However, many of the principal arguments will be relevant to these conditions as well.

I. GENERAL PROBLEMS IN SURVEY RESEARCH

The well documented variation in prevalence estimates is thought to result at least in part from several confounders common to survey and epidemiological research. Herzog and Fultz, [74] in a review of the prevalence and incidence of UI in community-dwelling populations, proposed that past investigations were plagued by sampling and non-response issues, by self selection and attrition, by definitional, conceptual, and measurement issues. It is clear that there are large methodological challenges to rigorous research in this field. In general, the quality of recent large studies has undoubtedly improved, but the scientific community must continue to deal with methodological challenges in order to achieve progress.

II. DIFFERENT DEFINITIONS AND MEASUREMENT

A major problem in research on UI has been the use of different definitions and measurements,

and this might contribute to the wide range of reported prevalence estimates. The former ICS definition of UI – as a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable - included objective demonstration of urine loss as one critical component. This aspect limited the ICS definition for community based epidemiological investigations, because objective demonstration of UI is difficult to achieve outside of the clinical setting, and studies which were able to include this aspect in their assessment might have produced different prevalences. In addition, a social or hygienic aspect of the definition was problematic in epidemiologic studies because it added a subjective aspect to an objectively defined condition and therefore confounded the investigation of prevalence, incidence, and risk factors. In our previous report we argued for reconsideration of the definition of UI, and we emphasized that the core of the definition should be "any involuntary loss of urine". In accordance with this view, ICS changed its definition in 2003 to UI being "the complaint of any involuntary leakage of urine".[1]

The new definition makes epidemiological research easier. But three consequences should be addressed:

1. Epidemiological studies should not be based on this definition alone, and all studies should include a minimal additional data set, standard confounders, and questions specific to the aim of the study. This is discussed in the Section on Recommendations for further research.

2. The number of persons fulfilling the definition will increase. This should not be interpreted as an increase in the number potential of patients.

3. Public awareness, case finding of health care personnel, and help seeking behaviour may be affected of a new and more extensive definition.

Studies have used different severity levels and time frames for defining UI. A further factor complicating the conceptualisation and measurement of UI in epidemiological studies lies in the nature of the condition. UI is a chronic condition (or set of conditions) that often starts slowly and comes and goes for a considerable time period before it become fully established. If people get used to their UI or notice it less, this can interfere with valid assessment.

Ideally self-report measures are validated by clinical evaluations. However, clinical and even urodynamic investigations should be regarded as other measures, not necessarily as gold standards, because it is known to be difficult to demonstrate all urinary symptoms in the clinical setting.

Holtedahl calculated prevalence estimates using different definitions of UI for the same sample of 50 to 70 year old women. The prevalence of any self-reported leakage was 47%. Self-reported regular UI with or without objective demonstration was found for 31% of women, regular incontinence according to the former full ICS definition for 19%. Another study found prevalences of 69% and 30% for any UI and the former ICS definition, respectively. The results indicate that the former ICS definition was rather restrictive.

Low response rates may further bias prevalence estimates. Known differences between responders and non-responders can be compensated during the analysis. The major problems is unknown differences in response rates and other characteristics. Incontinent women may not answer (or deny UI) because of embarrassment or related handicaps. But incontinent women may also find the subject particularly relevant and therefore respond to a greater extent than continent women. At present, we do not know much about how these factors may affect the comparison between incontinent and continent women.

One paper explored the problem of underreporting incontinence and how it can be altered with the use of an introduction to the incontinence questions and probing. Another paper explored the issue of selection bias in mailed surveys. The first wave had higher prevalence of incontinence than follow-up mailings, and thus individuals with UI tended to respond on the first wave. In an English mailed survey on incontinence and other urinary symptoms, a sample of non-responders were traced, and those eligible were asked questions from the survey. Compared with the responders, the non-responders overall showed little differences in reporting of urinary symptoms. However, non-responders >70 tended to be of poorer general health, and they reported certain urinary symptoms more frequently.

III. SUMMARY POINTS:

- The lack of epidemiological data from populations underrepresented in research limits the world wide application of the present information.
- Many investigations are plagued by sampling and non response issues, by self selection and attrition. Many early studies were obtained from sampling patients seeking care.
- A major problem is the use of different definitions of incontinence. The new ICS definition makes epidemiological research easier.
- There are large methodological challenges to research in the field of UI. Unless the scientific community deals with these issues, progress will be difficult to make.

K. HELP SEEKING BEHAVIOUR

I. URINARY INCONTINENCE

A majority of people with UI have not sought help, and this is confirmed also in recent publications. [454-455, 469-470] Reasons given by people for not seeking help include: not regarding incontinence as abnormal or serious, considering incontinence to be a normal part of ageing, having low expectations of treatment and thinking they should cope on their own. Some studies also confirm the notion that embarrassment may be an important reason for not seeking help [332-334] There is an association between help seeking and condition-specific factors like duration, frequency and amount, and people's perceptions of the impact of incontinence, but other more personal characteristics like individual health care behaviour and attitudes may also play a role.

In a Norwegian study 4.4 % of all women >20 years old in a community consulted their general practitioner for UI during a 3 year period. But mentioning the symptoms to a physician may not be enough. There are reports of doctors not responding, either by ignoring the statement of symptoms or by providing a dismissive explanation, and people interpreting a lack of response from the doctor as an indication that no treatment is available. In a study of management of incontinence in general practice, 30% of the women who had told their doctor about their symptoms perceived that they were offered no help. It is probable that many primary health care providers lack confidence in managing UI, and that this contributes to under treatment in those seeking help [338].

Only a small proportion of incontinent community-residing women have had surgery, medication, or exercise regimens. In addition to seeking help from the formal health care system, common responses to symptoms of illness are self-management and self-treatment behaviour. The major method of actively managing UI among community residents is the use of absorbent products.

It is obvious that millions of men and women suffer from their UI, and that for many of them good treatment options are available. However, for many persons with very mild or occasional UI it is probably adequate not to seek help from the health care system. Others are satisfied with just information and understanding about the causes and in many cases self care may be quite appropriate. A Danish study has shown that simple information and advice was adequate " treatment" for 23% of the women attending an open access incontinence clinic. A Swedish study found that among 136 women with UI, 36% wanted clinical evaluation, and only 24% subsequently started treatment.

Both epidemiological and qualitative research in this field should be encouraged in order to understand cultural, religious, and personal factors for help seeking behaviour world wide. Specifically, other than condition-specific factors should be further explored, e.g. persons' health care behaviour, perceptions and attitudes.

II. FAECAL INCONTINENCE AND PELVIC ORGAN PROLAPSE

There are indications of underreporting also of FI and patients' reluctance to report symptoms or to seek treatment.[787-788, 820] It has been shown that women are more willing to report FI than men. For POP we have no information.

III. SUMMARY POINTS:

- Recent publications confirm that a majority of people with FI, UI, and POP have not sought help.
- Only a small proportion of urinary incontinent community-residing people have had surgery, medication, or exercise regimens.
- Increasing severity, increasing duration, and urgency/mixed type of UI are related to consulting a health care provider.
- Associations other than condition-specific factors should be further explored in future research, e.g. persons' health care behaviour, perceptions and attitudes.
- Health care personnel should be encouraged to approach those at risk for FI, UI and POP. People with such symptoms should be assessed so services and treatment can be offered and targeted. The patient's view of management, even denial, should be respected.

L. EPIDEMIOLOGY AND CLINICAL WORK: FROM RESPONDENT TO PATIENT

We have emphasised some major and important differences between epidemiology and clinical work. These differences may have several implications. A selection process is most often accomplished first by self-selection (help seeking), then a referral system, which provides specialist physicians to a patient population with higher prevalence of disease, more severe disease, and often skewed type distribution, thus obtaining

test results with fewer false positives, better diagnostic accuracy, and more efficient use of resources. However, such intended and purposeful selection bias has its drawbacks. There is growing evidence that this selection process introduces bias into research and hampers our ability to generalise hospital based research back to general or primary care populations. Furthermore, it may result in recommendations and guidelines for diagnosis or therapy derived from tertiary care centres that are inappropriate at the primary care level. Often guidelines, review articles or teaching material do not take into account the varying prevalence and variation in clinical picture between community and hospital. They may also emphasise use of tests or equipment that are not appropriate or relevant for primary health care, thus leading to over utilisation of referrals. Data from hospitals or specialist level may also overestimate level of burden, costs and number of persons in need of treatment if such data are used for extrapolation back to community level. Therefore it is important that this Consultation uses different algorithms for initial and specialised care (see other relevant chapters).

One study provides substantial empirical evidence to support the existence of selection bias for UI. The analyses were based on three populations of incontinent women: Community level (epidemiological survey), primary care level (prospective study), and secondary care level (university hospital, prospective study). The general practice patients were older and the hospital patients younger than those in the community. From community via general practice to hospital, there was an increase in duration, frequency of leakage, amount of leakage, severity and perceived impact of incontinence. Help-seeking at the primary care level was associated with increasing age and severity, and with urgency symptoms and impact. Referral from general practice to hospital was only associated with (lower) age and urgency symptoms.

Under the subtitle Severity and impact we have given examples of how the prevalence estimates for women change dramatically when bothersomeness and severity are considered. Taken together with selection bias, this emphasises caution when epidemiological data are used in a clinical context. It concerns " level of care" in several ways; there is a large transitional zone from healthy to diseased, there is a danger of medicalisation, and there is a danger of treating patients at a higher level than necessary. Risk factors, predictors and correlates discovered in epidemiological studies are probabilistic of nature and may not be decisive in the clinical assessment of an individual patient. In addition, the attributable risk due to some known risk factors may be statistically but not clinically significant.

I. WORLDWIDE ESTIMATES OF CURRENT AND FUTURE INDIVIDUALS (≥20 YEARS) WITH LOWER URINARY TRACT SYMPTOMS INCLUDING URINARY INCONTINENCE AND OVERACTIVE BLADDER

In order to effectively plan health care resources it is necessary to estimate the prevalence and incidence of illnesses to know to what extent resources require to be allocated to a specific illness health care condition. This chapter has dealt with three major global problems, urinary and faecal incontinence as well as pelvic organ prolapse, that affect women and men throughout the world. Irwin and coworkers [885] have published data estimating the current and future worldwide prevalence of lower urinary tract symtoms.

The objective of the study was to estimate the current and future number of people with LUTS, including overactive bladder (OAB) and Urinary Incontinence (UI) utilising the current ICS definitions. Age- and gender-specific prevalence rates from the EPIC study[455] were applied to the worldwide over 20 year old population (4.2 billion) with males and females stratified into five-year age groups (20-24 to 80+). Projected population estimates for all worldwide regions were based on the United States Census Bureau International Database (IDB).

Estimates were presented for 2008, 2013 and 2018 and are summarised in **Tables 22 and 23**. **Table 22** summarises the estimated number of individuals with certain LUTS symptoms by year and sex in the world population and **Table 23** describes the estimated number of individuals of LUTS and OAB over 10 years across the world regions.

Estimates and projections featured in this analysis were based on prevalence rates of LUTS described in the EPIC study – based primarily on a European population. The prevalence rates featured in the EPIC study are similar to other prevalence rates of LUTS that were found in others studies across other countries [452,461]

The projections in this report assume the prevalence rates of LUTS will remain throughout the year 2018 for all age and sex groups

Prevalence of LUTS will also increase as other factors related to LUTS, such as obesity, increases (**Figures 16 & 17**). The estimated number for present and future years are not true numbers but are based on a projected population configured by the International Database (IDB). The IDB's estimates and projections are drawn by Census Bureau demographers and are based on reviewed censuses, surveys, and vital statistics provided by

Table 22. Estimated Number of Individuals with Certain LUTS By Year & Sex- World Population (In Millions)

LUTS Symptoms Incontinence	Male 2008	Male 2013	Male 2018	Female 2008	Female 2013	Female 2018
Any Incontinence	98	109	120	250	275	301
UUI	22	25	27	27	30	33
MUI	11	12	14	43	47	52
SUI	10	12	13	127	140	153
Other1	55	61	66	53	58	64
Storage						
Any Storage Symptom (Noct2 ≥1)	1,050	1,151	1,250	1,249	1,363	1,474
Any Storage Symptom (Noct ≥2)	597	655	713	760	831	901
Noct ≥1	942	1,035	1,127	1,098	1,200	1,301
Noct ≥2	388	427	467	464	509	555
Urgency	205	226	247	249	273	297
Frequency	127	139	152	161	174	186
Voiding Symptoms						
Voiding Symptoms	515	563	610	402	511	473
Intermittency	164	181	198	148	176	175
Slow Stream	156	173	193	122	161	146
Straining	132	145	157	83	120	98
Term Dribble	289	315	340	210	276	245
Post Micturition Symptoms						
Post Mic3 Symptoms	332	365	396	297	350	348
Incomplete Emptying	263	288	314	257	290	302
Other Post Mic Incontinence	108	118	129	64	96	76
Any LUTS (Noct ≥1)						
Any LUTS (Noct ≥1)	1,260	1,377	1,490	1,379	1,460	1,623
Storage + Voiding Symptoms (Noct ≥1)	350	386	422	309	373	367
Storage + Post Mic Symptoms (Noct ≥1)	247	273	299	238	274	282
Voiding + Post Mic Symptoms (Noct ≥1)	205	226	247	158	205	187
Storage + Voiding + Post Mic Symptoms (Noct ≥1)	166	183	202	137	173	163
Any LUTS (Noct ≥2)						
Any LUTS (Noct ≥2)	933	1,020	1,104	994	1,068	1,170
Storage + Voiding Symptoms (Noct ≥2)	247	273	299	237	275	283
Storage + Post Mic Symptoms (Noct ≥2)	188	207	227	190	214	226
Voiding + Post Mic Symptoms (Noct ≥2)	205	226	247	158	205	187
Storage + Voiding + Post Mic Symptoms (Noct ≥2)	130	144	158	119	142	142

Table 23. Estimated Worldwide Number of Individuals with LUTS including OAB and Incontinence by Region (In Millions)

	Estimated Number of individuals with any LUTS			Estimated Number of Individuals with OAB			Estimated Number of Individuals with Incontinence		
Region	2008	2013	2018	2008	2013	2018	2008	2013	2018
World	1,930	2,106	2,277	455	500	545	346	383	420
Africa	203	231	263	46	53	60	33	38	43
North America	167	180	193	40	44	48	32	34	37
South America	111	122	133	26	29	32	20	22	24
Asia	1,166	1,284	1,396	272	302	332	206	231	256
Europe	273	278	280	68	70	71	54	56	57

Table 24. Summary of major findings

46% of the 4.2 billion of the adult world population (≥ 20 and over) experience any LUTS

455 million individuals or 11% of the world population estimated to experience OAB symptoms

346 million individuals or 8% of the world population estimated to experience some type of UI

SUI is the most common type of incontinence in 2008 and 2018 (Figure 1)

136 (3%) and 164 (4%) million individuals are estimated to experience SUI in 2008 and in 2018 respectively

49 (1%) and 60 (1%) million individuals are estimated to experience UUI in 2008 and in 2018 respectively

53(1%) and 65 (1%) million individuals are estimated to experience MUI in 2008 and in 2018 respectively

108 (3%) and 131 (3%) million individuals are estimated to experience Other Incontinence in 2008 and in 2018 respectively

Assuming LUTS prevalence rates remain stable for the next ten years, 2.3 billion individuals are estimated to experience LUTS by the year 2018
An increase of 18% from 2008

Storage symptoms has the highest burden in both the male and female population than other LUTS (Figure 2)

Male: estimated 597 million in 2008, 713 million in 2018

Female: estimated 760 million in 2008, 901 million in 2018

Asia region is estimated to carry the highest burden of LUTS. Estimated 1.2 billion individuals in Asia regions may experience any LUTS

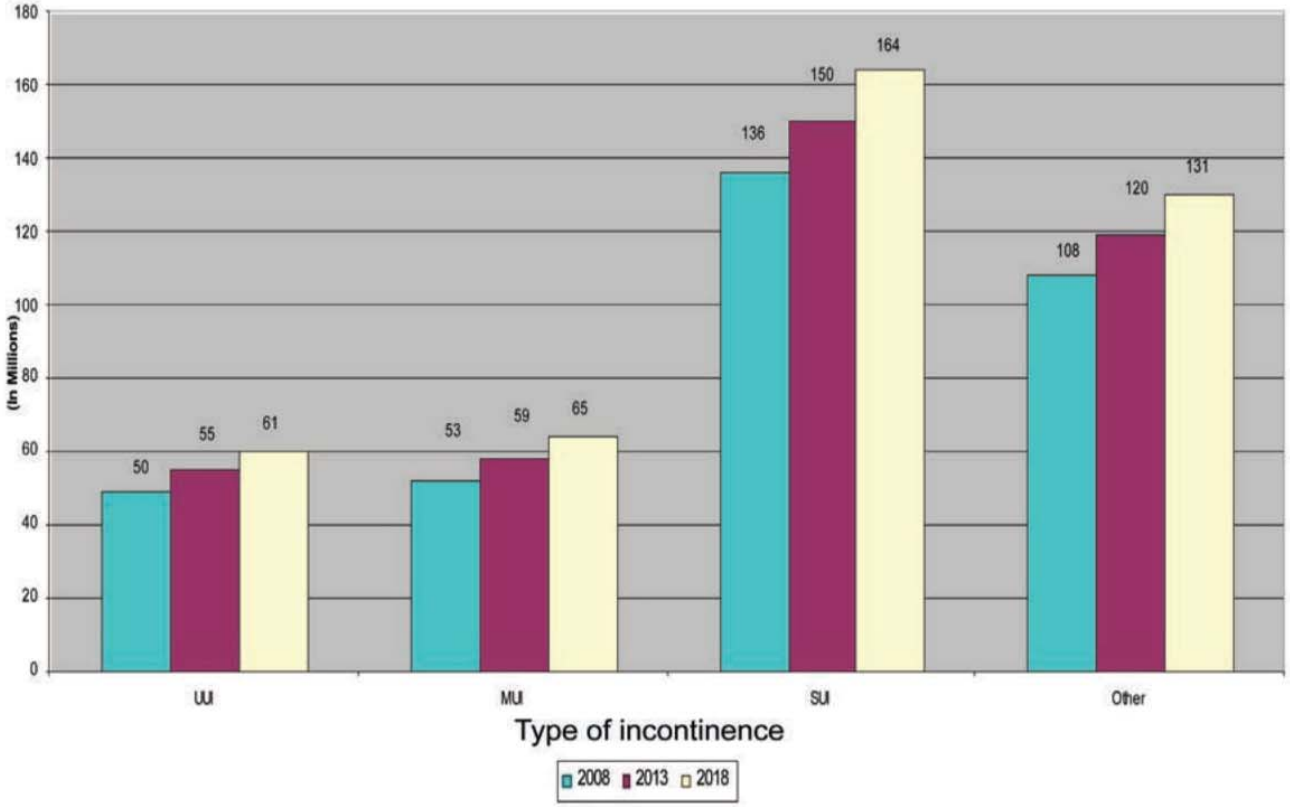


figure 16. Estimated number of individuals with UI 2008, 2013 and 2018 grouped according to type of incontinence

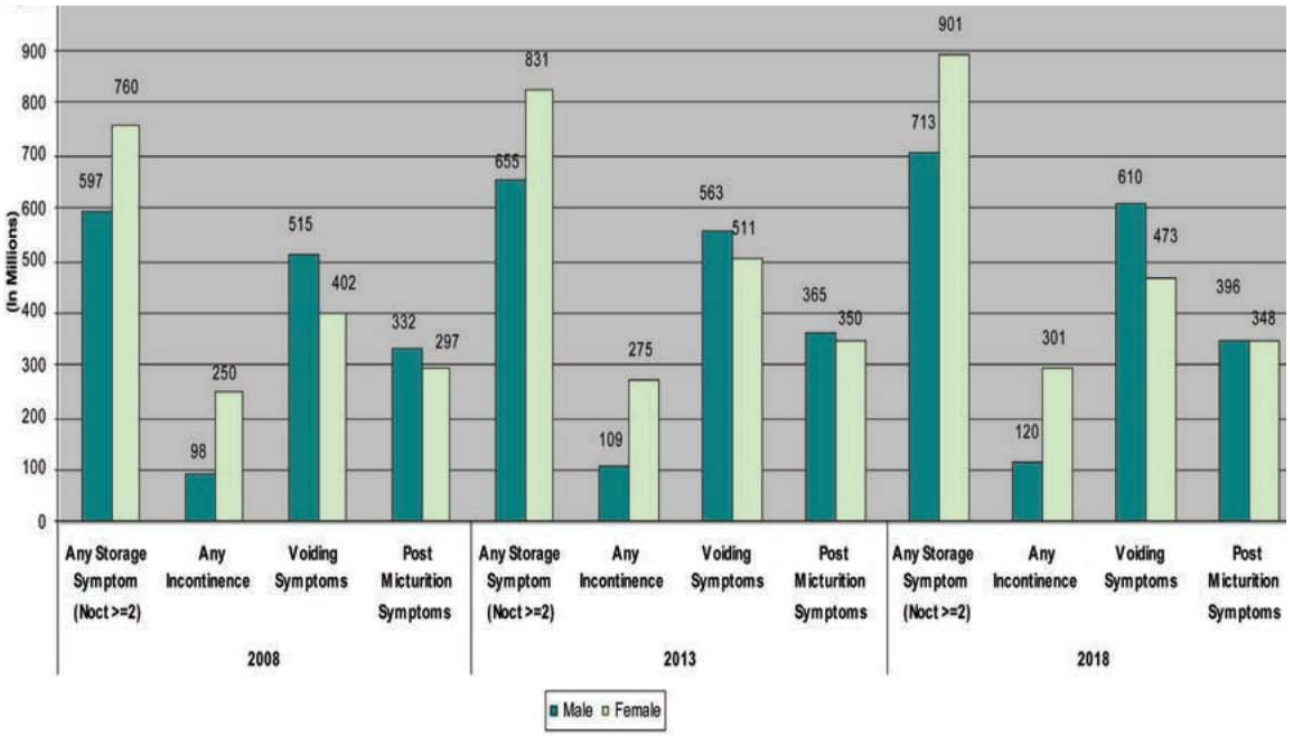


figure 17. Estimated number of individuals with LUTS 2008, 2013 and 2018 grouped according to gender.

National Statistics Offices9. Data on international migration and refugee movements, public health efforts, socio-political circumstances, and historical events such as natural disasters and conflict are all considered when the IDB calculates the estimates and projections.

It is anticipated that with the overall aging of the population the prevalence of LUTS will also increase.

It has been shown that LUTS are burdensome to individuals [397,539] and the likely increase in the number of individuals experiencing. LUTS has implications on healthcare resources and overall health burden. This analysis is an estimate of the number of individuals with LUTS based on a conservative prevalence rate, and so the future number of those with certain LUTS may surpass those of this report.

II. SUMMARY POINTS

- The spectrum of severity of anal and urinary incontinence, as well as pelvic organ prolapse, and the symptom profile of patients referred to specialist centres do not necessarily reflect the spectrum of disease seen in the community.
- The selection and referral process may introduce bias into research and hamper the ability to generalise hospital-based research back to primary care populations.
- One should be very careful with calculating numbers of patients in need of therapy based on epidemiological data.

M. RECOMMENDATIONS FOR FURTHER RESEARCH

Much biomedical research is observational and the reporting of such research is often inadequate which hampers the assessment of its strengths and weaknesses and of a study´s generalisability. The STROBE (Strengthening of the Reporting of OBservational studies in Epidemiology) statement was introduced [661]. It is a a checklist of items that should be addressed in articles reporting on the three main study designs of analytical epidemiology: cohort, case-control, and cross sectional studies. The use of this checklist is highly recommended.

I. URINARY INCONTINENCE

It is recommended that more sustained research on measurement of UI should be performed including, its types and severity to move the research ahead. Longitudinal study designs are needed to estimate incidence of UI and describe the course of the condition and its different forms and to investigate its risk factors and possible protective factors.

There is still little knowledge with regard to prevalence, incidence, and other epidemiological data in developing countries. It is recommended that fundamental research regarding prevalence, incidence and other epidemiological data in developing countries should be encouraged, and tailored to the cultural, economic and social environment of the population under study.

Crude prevalence studies (descriptive epidemiology) from USA and Europe are abundant, and further studies should be done only with recommended and validated questionnaires or in order to combine data from the prevalence study with studies of co-factors and predictors (analytical epidemiology). Control for confounders, stratification, and multivariate techniques should be increasingly used because of the need for more advanced epidemiological analyses of risk factors and comorbidity. Strength of associations should be determined by relative risks and odds ratios, and confidence limits should be given. We still have very little knowledge of the absolute and relative importance of several risk factors, and almost no information about the attributable risk of the factors in the society.

Some potential risk and protective factors deserve more attention. For example, the role of pregnancy and childbirth in the development of UI must be studied in a fashion that links population-based methods to clinical assessment of pregnancy, delivery and the birth trauma and follows women over many years. Such a design is necessary because the effect of pregnancy and childbirth may become clear only years later when the woman is older and because the woman will not be able to report the exact nature of the tear or episiotomy, etc. There should be more emphasis on the associations between UI and specific diseases like stroke, diabetes, psychiatric disease and genital prolapse. Genetic components should be investigated.

Primary prevention is the main goal in the management of human disease. An important strategy would thus be to identify the individuals at risk, and then take measures to reduce the risk among those individuals or in certain risk groups. Based on current knowledge there are no well documented efforts that can be done in order to avoid the occurrence of UI in large populations. Primary prevention studies should be encouraged, but the epidemiological basis for choosing appropriate interventions is weak.

In surveys based on questionnaires or interviews symptoms can be registered. There are convincing data suggesting that the different types may reflect quite different pathologies and risk factors. Differentiating the types in future research might therefore prove very fruitful. Methodological work has still to be done in this area, but typical type descriptions should be included in new studies. Likewise, studies of risk factors should include important and known confounders such as age, parity, and weight.

Variations in definitions and measurement issues are fundamental and lead to problems with assessing the findings in epidemiological studies. We need to improve epidemiological studies by including variables that better characterise UI, so that more advanced and informative analyses may be conducted. It is therefore recommended that all epidemiological studies include a minimum data set (**Table 25**), including elements of screening question, frequency measure, quantity of urine loss, duration, type, and severity. In addition, it is recommended that validated measures of bother/quality of life and urinary symptoms other than UI should be included. We here also refer to the chapter from the committee on symptom and quality of life assessment.

In addition, it is recommended that validated measures of bother/quality of life and urinary symptoms other than UI should be included.

II. FAECAL INCONTINENCE AND PELVIC ORGAN PROLAPSE

In these areas there is a need for more epidemiological research in all areas; prevalence, incidence, and risk factors. Many of the fundamental methodological issues relevant to UI discussed above are highly relevant to the fields of FI and POP.

The committee emphasises that uniform definitions of FI and POP should be used in studies, and there should be a move towards a standardisation of measurement instruments in community surveys that can be used worldwide. Developing definitions is a scientific process requiring careful conceptualisation of the condition in light of its many clinical presentations and underlying mechanisms. This will require a multi-method approach and consideration of issues such a reliability and validity.

Table 25. Elements in a minimum data set recommended for all epidemiological studies

- Screening question for any involuntary urine loss.
- Frequency measure. For example, classification into categories of none, less than once a month, one/several times a month, one/several times a week, every day/nigth, all the time.
- Quantity of urine loss for a typical episode. For example, classification into categories of none, drops, small amounts, moderate amounts, much/a great deal.
- Duration. For example months, years.
- Type. Based on typical description; stress, urge, mixed and other.
- Severity. Either by combining excisting questions or by a validated index.

REFERENCES

1. Abrams, P., Cardozo, L., Fall, M., Griffits, D. Rosier, P., Ulmsten, U. et al. : The standardisation of terminology in lower urinary tract function : report from the standardisation sub-committee of the International Continence Society. Urology, 61: 37m 2003.
2. Haylen BT, De Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Neurourol. Urodyn. 2010. p. 4–20.
3. Stroup, D. F., Berlin, J.A., Morton, S. C., Olkin, I., Williamson, G. D., Rennie, D. et al. : Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observtional Studies in Epidemiology (MOOSE) group. JAMA 283: 2008, 2002.
4. Nevéus, T., et al., The Standardization of Terminology of Lower Urinary Function in Children and Adolcents: Report from standardisation Committee of International Children´s Continence Society. J Urol, 2006. 176: p. 314 - 324.
5. Rittig, S., et al., Abdorminal diurnal rhythm of plasma vasopressin and urinary output in patients with enuresis. Am J Physiol, 1989. 25: p. 664-666.
6. Yeung, C.K., Chiu, H.N., Sit, F.K., Bladder dysfunction in children with refractory monosymptomatic primary nocturnak enuresis. J Urol, 1999. 162: p. 1049-55.
7. Holmdahl, G., et al., Four-hours voiding observation in healthy infants. Scan J Urol Nephrol, 1996. 156: p. 1808-1812.
8. Jansson, U.-B., et al., Voiding pattern and acquisition of bladder control from birth to age 6 years - a longitudinal study. J Urol, 2005. 174: p. 298 - 293.
9. Kranz, I., et al., On the Epidemiology of Nocturnal Enuresis - A Critical Rewiew of Methods used in descriptive Epidemiological studies on Nocturnal Enuresis. 1994: p. 75-81.
10. McGree, R., et al., A longitudinal study of enuresis from five to nine years. Aust. Paediatr. J., 1984. 20: p. 39-42.
11. Forsythe, W.I. and A. Redmond, Enuresis and spontaneous cure rate - study of 1129 enuretics. Arch Dis Child, 1974. 49: p. 259-263.
12. Fergusson, D.M., L.J. Horwood, and F.T. Shannon, Factors Related to the Age of Attainment of Nocturnal Bladder Control: An 8-Year Longitudinal Study. Pediatrics, 1986. 87(5): p. 884-890.
13. Fergusson, D.M. and L.J. Horwood. Nocturnal enuresis and behavioral problems in adolescence: a 15-year longitudinal study. Pediatrics, 1994. 94(5): p. 662-668.
14. Feehan, M., et al., A 6 year follow-up of childhood enuresis: Prevalence in adolescence and consequences for mental health. J. Paediatr. Child Health, 1990. 26: p. 75-79.
15. Butler, R.J. and J. Heron, The prevalence of infrequent bedwetting and nocturnal enuresis in childhood. A large British cohort. Scandinavian journal of urology and nephrology, 2008. 42(3): p. 257-64.
16. Chiozza, M., L, et al., An Italian epidemiological multicentre study of nocturnal enuresis. BJU, 1998. 81.suppl.3: p. 86-89.
17. Yeung, C.K., Nocturnal Enuresis in Hong Kong: Different Chinese Phenotypes. Scan J Urol Nephrol, 1996. suppl.31: p. 17-21.
18. Spee- van der Wekke, J., et al., Childhood nocturnal enuresis in the Netherlands. Urology, 1998. 51: p. 1022.
19. Cher, T.-W., G.-J. Lin, and K.-H. Hsu, Prevalence of nocturnal enuresis and associated familiar factors in primary school children in Taiwan. J Urol, 2002. 168: p. 1142-1146.
20. Serel, T.K., et al., epidemiology of enuresis in Turkish children. Scan J Urol Nephrol, 1997. 31: p. 537.
21. Lee, S.D., et al., An epidemiological study of enuresis in Korean children. BJU Int., 2000. 85: p. 869-873.
22. Kajiwara, M., et al., Nocturnal enuresis and overactive bladder in children: An epidemiological study. Int J Urol, 2006. 13: p. 36-41.
23. Söderstrom, U., et al., Urinary and faecal incontinence: A population-based study. Acta Paediatr, 2004. 93: p. 386-89.
24. Yeung, C.K., et al., differences in characteristics of nocturnal enuresis between children and adolescents: A critical appraisal from a large epidemiological study. BJU Int., 2006. 97(5): p. 1069-73.
25. Kanaheswari, Y., Epidemiology of childhood nocturnal enuresis in Malaysia. J Paediatr Child Health, 2003. 39(2): p. 118-123.
26. Su, M.S., et al., Nocturnal enuresis in children: prevalence, correlates, and relationship with obstructive sleep apnea. The Journal of pediatrics, 2011. 159(2): p. 238-42 e1.
27. Hellström, A.-L., et al., Micturition habits and incontinence in 7-year-ola Swedish school entrants. Eur J Pediatr, 1990. 149(6): p. 434-437.
28. Järvelin, M.R., et al., Enuresis in Seven-Year-Old Children. Acta Paediatr Scan, 1988. 77: p. 148-153.
29. Hellström, A.-L., et al., Micturition habits and incontinence at age 17 - reinvestigation of a cohort studied at age 7. BJU, 1995. 76: p. 231-234.
30. Swithinbank, L.V., J.C. Carr, and P.H. Abrams, Longitudinal Study of Urinary Symptoms in Children. Scan J Urol Nephrol, 1994. Suppl 163: p. 163-167.
31. Swithinbank, L.V., et al., The natural history of urinary symtoms during adolescence. BJU, 1998. 81, Suppl 3: p. 90-93.
32. Hirasing, R.A., et al., Enuresis Nocturna in Adults. Scan J Urol Nephrol, 1997. 31: p. 533-536.
33. Nevéus, T., et al., Deepth of sleep and sleep habits among enuretic and incontinence children. Acta Paediatr, 1999. 88: p. 748.
34. Bower, W.F., et al., The epidemiology of childhood enuresis in Australia. British Journal of Urology, 1996. 78: p. 602-606.
35. Gümüs, B., et al., Prevalence of nocturnal enuresis and accompanying factors in children aged 7-11 years in Turkey. Acta Paediatr, 1999. 88: p. 1369.
36. Watanabe, H. and A. Kawauchi, Nocturnal Enuresis: Social Aspects and Traetment in Japan. Scan J Urol Nephrol, 1994. suppl. 163: p. 29-38.
37. Liu, X., et al., Attaining Nocturnal Urinary Control, Nocturnal Enuresis, and Behavioral Problems in Chinese Children Aged 6 Through 16 Years. J Am Acard Child Adolesc Phychiatry, 2000. 39(12): p. 1557-1564.
38. Sureshkumar, P., et al., Risk factors for nocturnal enuresis in school-age children. The Journal of urology, 2009. 182(6): p. 2893-9.
39. Järvelin, M.R., et al., Aetiological and Percipitating Factors for Childhood Enuresis. Acta Paediatr Scan, 1991. 80: p. 361-369.
40. von Gontard, A., J. Heron, and C. Joinson, Family history of nocturnal enuresis and urinary incontinence: results from a large epidemiological study. The Journal of urology, 2011. 185(6): p. 2303-6.
41. Eiberg, H., Nocturnal enuresis is linked to a specific gene. Scan J Urol Nephrol, 1995. Suppl.173: p. 15.
42. Arnell, H., et al., The genetics of primary nocturnal enuresis: inheritance and suggestion of a second major gene on chromosome 12q. J Med Genet, 1997. 34: p. 360.
43. von Gontard, A., et al., Molecular genetics of nocturnal enuresis: clinical and genetic heterogeneity. Acta Paediatr, 1997. 87: p. 571.
44. Moilanen, I., et al., A follow-up of enuresis from childhood to adolescence. BJU, 1998. 81,suppl.3: p. 94-97.
45. Schulpen, T., The burden of nocturnal enuresis. Acta Paediatr, 1997. 86(9): p. 981-984.
46. van Hoecke, E., et al., Socioeconomic Status as a Common Factor Underlaying the Association Between Enure-

sis and Psychopathology. J Dev Behav Pediatrics, 2003. 24(2): p. 109-114.

47. Coppola, G., et al., Psychological correlates of enuresis: a case-control study on an Italian sample. Pediatric nephrology, 2011. 26(10): p. 1829-36.
48. Kawauchi, A., et al., Follow-up study of bedwetting from 3 to 5 years of age. Urology, 2001. 58(5): p. 772-776.
49. Lunsing, R.J., et al., Nocturnal enuresis and minor Neurological dysfunction at 12 years: A follow-up study. Dev Medicine and Child Neurology, 1991. 33: p. 439-445.
50. Duel, B.P., et al., A survey of voiding dysfunction in children with attention deficit-hyperactivity disorder. J Urol, 2003. 170: p. 1521-1524.
51. Robson, W.L.M., et al., Enuresis in childraen with attention deficit hyperactivity disorder. Southern Medical Journal, 1997. 90: p. 503.
52. Elia, J., et al., Nocturnal enuresis: a suggestive endophenotype marker for a subgroup of inattentive attention-deficit/hyperactivity disorder. The Journal of pediatrics, 2009. 155(2): p. 239-44 e5.
53. Wolfish, N.M., R.T. Pivik, and K.A. Busby, Elevated sleep arousal thresholds in enuretic boys: clinical implications. Acta Paediatr, 1997. 86: p. 381-384.
54. Kawauchi, A., et al., Changes in the structure of sleep spindles and delta waves on electroencephalography in patients with nocturnal enuresis. BJU, 1998. 81, suppl. 3: p. 72-75.
55. Hunsballe, J.M., Increased delta component in computerized sleep electroencephalographic analysis suggest abnormally deep sleep in primary monosymptomatic nocturnal enuresis. Scan J Urol Nephrol, 2000. 34: p. 294.
56. Chandra, M., et al., Prevalence of diurnal voiding symptoms and difficult arousal from sleep in children with nocturnal enuresis. J Urol, 2004. 172: p. 311-16.
57. Osungbade, K.O. and F.O. Oshiname, Prevalence and perception of nocturnal enuresis in children of a rural community in southwestern Nigeria. Trop Doc, 2003. 33(4): p. 243-236.
58. Baruzzi, A., et al., Atrial natriuretic peptide and catecholamines in obstructive sleep apnoea. Sleep, 1991. 14: p. 83.
59. Barone, J.G., et al., Nocturnal enuresis and overweight are associated with obstructive sleep apnea. Pediatrics, 2009. 124(1): p. e53-9.
60. Weider, D.J., M.j. Sateia, and R.p. West, Nocturnal enuresis in children with upper airway obstruction. Otolaryngol Head Neck Surg, 1991. 105: p. 427-432.
61. Loening-Baucke, V., Urinary Incontinence and Urinary Tract Infection and Their Resolution With Treatment of Chronic Constipation of Childhood. Pediatrics, 1997. 100(2): p. 228-232.
62. Forbes, F.C., Children with enuresis. Nowdays, a strong suspicion of sexualabuse would prompt full investigation. BMJ, 1998. 316: p. 777.
63. Ferrara, P., et al., Preliminary data on monosymptomatic nocturnal enuresis in children and adolescents with type 1 diabetes. Scan J Urol Nephrol, 2006. 40: p. 238-40.
64. Hoebeke, P., et al., One thousend video-urodynamic studies in children with non-neurogenic bladder sphincter dysfunction. BJU Int., 2001. 87: p. 575-580.
65. Hellerstein, S., Voiding Dysfunction in Pediatric Patients. Clin Pediatr (Phila), 2003. 42(1): p. 43-49.
66. Kajiwara, M., et al., The micturition habits and prevalence of daytime urinary incontinence in Japanese primary school children. J Urol, 2004. 171: p. 403-7.
67. Joinson, C., et al., Psychological problems in children with daytime wetting. Pediatric, 2006. 118(5): p. 1985-93.
68. Swithinbank, L.V., et al., The natural history of daytime urinary incontinence in children: a large British cohort. Acta paediatrica, 2010. 99(7): p. 1031-6.
69. Sureshkumar, P., et al., A population based study of 2,856 school-age children with urinary incontinence. The Journal of urology, 2009. 181(2): p. 808-15; discussion 815-6.
70. von Gontard, A., Hollmann,E., Comorbidity of functional urinary incontinence and enkopresis: Somatic and behavioural associations. J Urol, 2004. 171: p. 2644-47.
71. Sureshkumer P., C.P., Roy L.P, Knight J.F.,, et al., Daytime urinary incontinence in primary school children: A population-based survey. The Journal of Pediatrics, 2001. 137(6): p. 814-818.
72. Lettgren, B., et al., Urge incontinence and voiding postponement in children : somatic and phsychosocial factors. Acta Paediatr, 2002. 91: p. 978-984.
73. Zink, S., C.M. Freitag, and A. von Gontard, Behavioral comorbidity differs in subtypes of enuresis and urinary incontinence. J Urol, 2008. 179: p. 295-8.
74. Fultz NH, Herzog AR. Prevalence of urinary incontinence in middle-aged and older women: a survey-based methodological experiment. J Aging Health. 2000 Nov.;12(4):459–469.
75. van Leijsen SAL, Evert JSH-V, Mol BWJ, Vierhout ME, Milani AL, Heesakkers JPFA, et al. The correlation between clinical and urodynamic diagnosis in classifying the type of urinary incontinence in women. A systematic review of the literature. Neurourol. Urodyn. 2011 Feb. 4;30(4):495–502.
76. Bosch JLHR, Cardozo L, Hashim H, Hilton P, Oelke M, Robinson D. Constructing trials to show whether urodynamic studies are necessary in lower urinary tract dysfunction. Neurourol. Urodyn. 2011 Jun.;30(5):735–740.
77. Minassian VA, Stewart WF, Hirsch AG. Why do stress and urge incontinence co-occur much more often than expected? Int Urogynecol J Pelvic Floor Dysfunct. 2008 Oct.;19(10):1429–1440.
78. Sandvik H, Hunskaar S, Vanvik A, Bratt H, Seim A, Hermstad R. Diagnostic classification of female urinary incontinence: an epidemiological survey corrected for validity. J Clin Epidemiol. 1995 Mar.;48(3):339–343.
79. Digesu GA, Salvatore S, Fernando R, Khullar V. Mixed urinary symptoms: What are the urodynamic findings? Neurourol. Urodyn. 2008;27(5):372–375.
80. Stach-Lempinen B, Kirkinen P, Laippala P, Metsänoja R, Kujansuu E. Do objective urodynamic or clinical findings determine impact of urinary incontinence or its treatment on quality of life? Urology. 2004 Jan.;63(1):67–71; discussion 71–2.
81. Lowenstein L, Dooley Y, Kenton K, Rickey L, FitzGerald MP, Mueller E, et al. The volume at which women leak first on urodynamic testing is not associated with quality of life, measures of urethral integrity or surgical failure. JURO. 2007 Jul.;178(1):193–196.
82. Elstad EA, Taubenberger SP, Botelho EM, Tennstedt SL. Beyond incontinence: the stigma of other urinary symptoms. J Adv Nurs. 2010 Nov.;66(11):2460–2470.
83. Thom DH, Van Den Eeden SK, Ragins AI, Wassel-Fyr C, Vittinghof E, Subak LL, et al. Differences in prevalence of urinary incontinence by race/ethnicity. JURO. 2006 Jan.;175(1):259–264.
84. Klovning A, Sandvik H, Hunskaar S. Web-based survey attracted age-biased sample with more severe illness than paper-based survey. J Clin Epidemiol. 2009 Oct.;62(10):1068–1074.
85. Walker GJA, Gunasekera P. Pelvic organ prolapse and incontinence in developing countries: review of prevalence and risk factors. Int Urogynecol J. 2011 Feb.;22(2):127–135.
86. Botlero R, Urquhart DM, Davis SR, Bell RJ. Prevalence and incidence of urinary incontinence in women: review of the literature and investigation of methodological issues. Int J Urol. 2008 Mar.;15(3):230–234.
87. Thom D. Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. J Am Geriatr Soc. 1998 Apr.;46(4):473–480.

88. Minassian VA, Stewart WF, Wood GC. Urinary incontinence in women: variation in prevalence estimates and risk factors. Obstet Gynecol. 2008 Feb.;111(2 Pt 1):324–331.

89. Hunskaar S, Lose G, Sykes D, Voss S. The prevalence of urinary incontinence in women in four European countries. BJU Int. 2004 Feb.;93(3):324–330.

90. Irwin DE, Milsom I, Hunskaar S, Reilly K, Kopp Z, Herschorn S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. Eur. Urol. 2006 Dec.;50(6):1306–14; discussion 1314–5.

91. Coyne KS, Sexton CC, Kopp ZS, Luks S, Gross A, Irwin D, et al. Rationale for the study methods and design of the epidemiology of lower urinary tract symptoms (EpiLUTS) study. BJU Int. 2009 Aug.;104(3):348–351.

92. Niang L, Kane R, Ndoye M, Jalloh M, Labou I, Diaw JJ, et al. [Urinary incontinence in woman: epidemiologic profile in Sub Saharian countries]. Prog. Urol. 2010 Dec.;20(13):1213–1216.

93. Coyne KS, Margolis MK, Kopp ZS, Kaplan SA. Racial Differences in the Prevalence of Overactive Bladder in the United States From the Epidemiology of LUTS (EpiLUTS) Study. Urology. 2012 Jan.;79(1):95–101.

94. Espuña-Pons M, Brugulat Guiteras P, Costa Sampere D, Medina Bustos A, Mompart Penina A. [Prevalence of urinary incontinence in Catalonia, Spain]. Med Clin (Barc). 2009 Nov. 14;133(18):702–705.

95. Herschorn S, Gajewski J, Schulz J, Corcos J. A population-based study of urinary symptoms and incontinence: the Canadian Urinary Bladder Survey. BJU Int. 2007 Oct.;0(0):071003001542002–???

96. Tähtinen RM, Auvinen A, Cartwright R, Johnson TM, Tammela TLJ, Tikkinen KAO. Smoking and bladder symptoms in women. Obstet Gynecol. 2011 Sep.;118(3):643–648.

97. Tennstedt SL, Link CL, Steers WD, McKinlay JB. Prevalence of and risk factors for urine leakage in a racially and ethnically diverse population of adults: the Boston Area Community Health (BACH) Survey. Am. J. Epidemiol. 2008 Feb. 15;167(4):390–399.

98. Lee K-S, Sung HH, Na S, Choo M-S. Prevalence of urinary incontinence in Korean women: results of a National Health Interview Survey. World J Urol. 2008 Apr.;26(2):179–185.

99. Zhu L, Lang J, Wang H, Han S, Huang J. The prevalence of and potential risk factors for female urinary incontinence in Beijing, China. Menopause. 2008 Apr.;15(3):566–569.

100. Nygaard I, Barber MD, Burgio KL, Kenton K, Meikle S, Schaffer J, et al. Prevalence of symptomatic pelvic floor disorders in US women. JAMA. 2008 Sep. 17;300(11):1311–1316.

101. Martínez Agulló E, Ruiz Cerdá JL, Gómez Pérez L, Ramírez Backhaus M, Delgado Oliva F, Rebollo P, et al. [Prevalence of urinary incontinence and hyperactive bladder in the Spanish population: results of the EPICC study]. Actas Urol Esp. 2009 Feb.;33(2):159–166.

102. Bodhare TN, Valsangkar S, Bele SD. An epidemiological study of urinary incontinence and its impact on quality of life among women aged 35 years and above in a rural area. Indian J Urol. 2010 Jul.;26(3):353–358.

103. Ojengbede OA, Morhason-Bello IO, Adedokun BO, Okonkwo NS, Kolade CO. Prevalence and the associated trigger factors of urinary incontinence among 5000 black women in sub-Saharan Africa: findings from a community survey. BJU Int. 2011 Mar. 25;107(11):1793–1800.

104. Ahmadi B, Alimohammadian M, Golestan B, Mahjubi B, Janani L, Mirzaei R. The hidden epidemic of urinary incontinence in women: a population-based study with emphasis on preventive strategies. Int Urogynecol J. 2010 Apr.;21(4):453–459.

105. Liapis A, Bakas P, Liapi S, Sioutis D, Creatsas G. Epidemiology of female urinary incontinence in the Greek population: EURIG study. Int Urogynecol J. 2010 Feb.;21(2):217–222.

106. Amaro JL, Macharelli CA, Yamamoto H, Kawano PR, Padovani CV, Agostinho AD. Prevalence and risk factors for urinary and fecal incontinence in Brazilian women. Int Braz J Urol. 2009 Aug.;35(5):592–7; discussion 598.

107. López M, Ortiz AP, Vargas R. Prevalence of urinary incontinence and its association with body mass index among women in Puerto Rico. J Womens Health (Larchmt). 2009 Oct.;18(10):1607–1614.

108. Correia S, Dinis P, Rolo F, Lunet N. Prevalence, treatment and known risk factors of urinary incontinence and overactive bladder in the non-institutionalized Portuguese population. Int Urogynecol J. 2009 Aug. 14;20(12):1481–1489.

109. Slieker-ten Hove MCP, Pool-Goudzwaard AL, Eijkemans MJC, Steegers-Theunissen RPM, Burger CW, Vierhout ME. Prevalence of double incontinence, risks and influence on quality of life in a general female population. Neurourol. Urodyn. 2010 Apr.;29(4):545–550.

110. Ge J, Yang P, Zhang Y, Li X, Wang Q, Lu Y. Prevalence and Risk Factors of Urinary Incontinence in Chinese Women: A Population-Based Study. Asia Pac J Public Health. 2011 Dec. 20.

111. Wennberg A-L, Molander U, Fall M, Edlund C, Peeker R, Milsom I. Lower urinary tract symptoms: lack of change in prevalence and help-seeking behaviour in two population-based surveys of women in 1991 and 2007. BJU Int. 2009 Oct.;104(7):954–959.

112. Franzén K, Johansson J-E, Andersson G, Pettersson N, Nilsson K. Urinary incontinence in women is not exclusively a medical problem: a population-based study on urinary incontinence and general living conditions. Scand. J. Urol. Nephrol. 2009;43(3):226–232.

113. Zhu L, Lang J, Liu C, Han S, Huang J, Li X. The epidemiological study of women with urinary incontinence and risk factors for stress urinary incontinence in China. Menopause. 2009 Jun.;16(4):831–836.

114. Lasserre A, Pelat C, Guéroult V, Hanslik T, Chartier-Kastler E, Blanchon T, et al. Urinary Incontinence in French Women: Prevalence, Risk Factors, and Impact on Quality of Life. Eur. Urol. 2009 Jul.;56(1):177–183.

115. Onur R, Deveci SE, Rahman S, Sevindik F, Acik Y. Prevalence and risk factors of female urinary incontinence in eastern Turkey. Int J Urol. 2009 Jun.;16(6):566–569.

116. Jackson S, Donovan J, Brookes S et al. The Bristol female lower urinary tract symptoms questionnaire: development and psychometric testing. Br J Urol. 1996 Jun;77(6):805-12.

117. Flyger H, Brasso K, Schou J et al. Validation of the self□ administered Danish Prostatic Symptom Score (DAN□ PSS□1) system for use in benign prostatic hyperplasia. Br J Urol. 1995 Oct;76(4):451-8.

118. Wyman JF, Harkins SW, Choi SC, Taylor JR, Fantl JA. Psychosocial impact of urinary incontinence in women. Obstet Gynecol. 1987 Sep.;70(3 Pt 1):378–381.

119. Pekkanen J, Sunyer J, Chinn S. Nondifferential disease misclassification may bias incidence risk ratios away from the null. J Clin Epidemiol. 2006 Mar.;59(3):281–289.

120. Wennberg A-L, Molander U, Fall M, Edlund C, Peeker R, Milsom I. A longitudinal population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in women. Eur. Urol. 2009 Apr.;55(4):783–791.

121. Samuelsson EC, Victor FT, Svärdsudd KF. Five-year incidence and remission rates of female urinary incontinence in a Swedish population less than 65 years old. Am. J. Obstet. Gynecol. 2000 Sep.;183(3):568–574.

122. Hägglund D, Walker-Engström M-L, Larsson G, Leppert J. Changes in urinary incontinence and quality of life after four years. A population-based study of women aged 22-50 years. Scand J Prim Health Care. 2004 Jun.;22(2):112–117.

123. Wehrberger C, Temml C, Ponholzer A, Madersbacher S. Incidence and remission of female urinary incontinence over 6.5 years: analysis of a health screening project. Eur. Urol. 2006 Aug.;50(2):327–332.

124. Townsend MK, Danforth KN, Lifford KL, Rosner B, Curhan GC, Resnick NM, et al. Incidence and remission of urinary incontinence in middle-aged women. Am. J. Obstet. Gynecol. 2007 Aug.;197(2):167.e1–5.

125. Dallosso HM, McGrother CW, Matthews RJ, Donaldson MMK, Leicestershire MRC Incontinence Study Group. The association of diet and other lifestyle factors with overactive bladder and stress incontinence: a longitudinal study in women. BJU Int. 2003 Jul.;92(1):69–77.

126. McGrother CW, Donaldson MMK, Shaw C, Matthews RJ, Hayward TA, Dallosso HM, et al. Storage symptoms of the bladder: prevalence, incidence and need for services in the UK. BJU Int. 2004 Apr.;93(6):763–769.

127. Donaldson MMK, Thompson JR, Matthews RJ, Dallosso HM, McGrother CW, Leicestershire MRC Incontinence Study Group. The natural history of overactive bladder and stress urinary incontinence in older women in the community: a 3-year prospective cohort study. Neurourol. Urodyn. 2006;25(7):709–716.

128. Waetjen LE, Liao S, Johnson WO, Sampselle CM, Sternfield B, Harlow SD, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. Am. J. Epidemiol. 2007 Feb. 1;165(3):309–318.

129. Liu C, Andrews GR. Prevalence and incidence of urinary incontinence in the elderly: a longitudinal study in South Australia. Chin. Med. J. 2002 Jan.;115(1):119–122.

130. Goode PS, Burgio KL, Redden DT, Markland A, Richter HE, Sawyer P, et al. Population based study of incidence and predictors of urinary incontinence in black and white older adults. J. Urol. 2008 Apr.;179(4):1449–53; discussion 1453–4.

131. Østbye T, Seim A, Krause KM, Feightner J, Hachinski V, Sykes E, et al. A 10-year follow-up of urinary and fecal incontinence among the oldest old in the community: the Canadian Study of Health and Aging. Can J Aging. 2004;23(4):319–331.

132. Møller LA, Lose G, Jørgensen T. Incidence and remission rates of lower urinary tract symptoms at one year in women aged 40-60: longitudinal study. BMJ. 2000 May 27;320(7247):1429–1432.

133. Holtedahl K, Hunskaar S. Prevalence, 1-year incidence and factors associated with urinary incontinence: a population based study of women 50-74 years of age in primary care. Maturitas. 1998 Jan. 12;28(3):205–211.

134. Byles J, Millar CJ, Sibbritt DW, Chiarelli P. Living with urinary incontinence: a longitudinal study of older women. Age Ageing. 2009 May;38(3):333–8; discussion 251.

135. Lifford KL, Townsend MK, Curhan GC, Resnick NM, Grodstein F. The epidemiology of urinary incontinence in older women: incidence, progression, and remission. J Am Geriatr Soc. 2008 Jul.;56(7):1191–1198.

136. Jackson SL, Scholes D, Boyko EJ, Abraham L, Fihn SD. Predictors of urinary incontinence in a prospective cohort of postmenopausal women. Obstet Gynecol. 2006 Oct.;108(4):855–862.

137. Nygaard IE, Lemke JH. Urinary incontinence in rural older women: prevalence, incidence and remission. J Am Geriatr Soc. 1996 Sep.;44(9):1049–1054.

138. Gavira Iglesias F, Caridad Y Ocerín JM, Guerrero Muñoz JB, López Pérez M, Romero López M, Pavón Aranguren MV. [Five-year follow-up of urinary incontinence in older people in a Spanish rural population]. Aten Primaria. 2005 Feb. 15;35(2):67–74.

139. Herzog AR, Diokno AC, Brown MB, Normolle DP, Brock BM. Two-year incidence, remission, and change patterns of urinary incontinence in noninstitutionalized older adults. J Gerontol. 1990 Mar.;45(2):M67–74.

140. Burgio KL, Matthews KA, Engel BT. Prevalence, incidence and correlates of urinary incontinence in healthy, middle-aged women. JURO. 1991 Nov.;146(5):1255–1259.

141. Melville JL, Fan M-Y, Rau H, Nygaard IE, Katon WJ. Major depression and urinary incontinence in women: temporal associations in an epidemiologic sample. Am. J. Obstet. Gynecol. 2009 Nov.;201(5):490.e1–7.

142. Jahanlu D, Hunskaar S. The Hordaland women's cohort: prevalence, incidence, and remission of urinary incontinence in middle-aged women. Int Urogynecol J. 2010 May 7;21(10):1223–1229.

143. Botlero R, Davis SR, Urquhart DM, Bell RJ. Incidence and resolution rates of different types of urinary incontinence in women: findings from a cohort study. J. Urol. 2011 Apr.;185(4):1331–1337.

144. Hannestad Y, Rortveit G, Sandvik H. ScienceDirect - Journal of Clinical Epidemiology : A community-based epidemiological survey of female urinary incontinence:: The Norwegian EPINCONT Study. Journal of Clinical …. 2000.

145. Grodstein F, Fretts R, Lifford K, Resnick N, Curhan G. Association of age, race, and obstetric history with urinary symptoms among women in the Nurses' Health Study. Am. J. Obstet. Gynecol. 2003 Aug.;189(2):428–434.

146. Mishra GD, Cardozo L, Kuh D. Menopausal transition and the risk of urinary incontinence: results from a British prospective cohort. BJU Int. 2010 Oct.;106(8):1170–1175.

147. Simeonova Z, Milsom I, Kullendorff AM, Molander U, Bengtsson C. The prevalence of urinary incontinence and its influence on the quality of life in women from an urban Swedish population. Acta Obstet Gynecol Scand. 1999 Jul.;78(6):546–551.

148. Sgadari A, Topinková E, Bjørnson J, Bernabei R. Urinary incontinence in nursing home residents: a cross-national comparison. Age Ageing. 1997 Sep.;26 Suppl 2:49–54.

149. Offermans MPW, Moulin Du MFMT, Hamers JPH, Dassen T, Halfens RJG. Prevalence of urinary incontinence and associated risk factors in nursing home residents: a systematic review. Neurourol. Urodyn. 2009;28(4):288–294.

150. Adelmann PK. Prevalence and detection of urinary incontinence among older Medicaid recipients. J Health Care Poor Underserved. 2004 Feb.;15(1):99–112.

151. Holroyd-Leduc JM, Mehta KM, Covinsky KE. Urinary incontinence and its association with death, nursing home admission, and functional decline. J Am Geriatr Soc. 2004 May;52(5):712–718.

152. Waetjen LE, Ye J, Feng W-Y, Johnson WO, Greendale GA, Sampselle CM, et al. Association between menopausal transition stages and developing urinary incontinence. Obstet Gynecol. 2009 Nov.;114(5):989–998.

153. Jahanlu D, Hunskaar S. Type and severity of new-onset urinary incontinence in middle-aged women: the Hordaland Women's Cohort. Neurourol. Urodyn. 2011 Jan.;30(1):87–92.

154. Hunskaar S. A systematic review of overweight and obesity as risk factors and targets for clinical intervention for urinary incontinence in women. Neurourol. Urodyn. 2008;27(8):749–757.

155. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. J. Urol. 2009 Dec.;182(6 Suppl):S2–7.

156. Danforth KN, Townsend MK, Lifford K, Curhan GC, Resnick NM, Grodstein F. Risk factors for urinary incontinence among middle-aged women. Am. J. Obstet. Gynecol. 2006 Feb.;194(2):339–345.

157. Chiarelli P, Brown W, McElduff P. Leaking urine: prevalence and associated factors in Australian women. Neurourol. Urodyn. 1999;18(6):567–577.

158. Brown JS, Grady D, Ouslander JG, Herzog AR, Varner RE, Posner SF. Prevalence of urinary incontinence and associated risk factors in postmenopausal women. Heart & Estrogen/Progestin Replacement Study (HERS) Research Group. Obstet Gynecol. 1999 Jul.;94(1):66–70.

159. Kuh D, Cardozo L, Hardy R. Urinary incontinence in middle aged women: childhood enuresis and other lifetime risk factors in a British prospective cohort. J Epidemiol Community Health. 1999 Aug.;53(8):453–458.

160. Hannestad YS, Rortveit G, Daltveit AK, Hunskaar S. Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. BJOG: An International Journal of Obstetrics & Gynaecology. 2003 Mar.;110(3):247–254.

161. Mishra GD, Hardy R, Cardozo L, Kuh D. Body weight through adult life and risk of urinary incontinence in middle-aged women: results from a British prospective cohort. Int J Obes (Lond). 2008 Sep.;32(9):1415–1422.

162. Townsend MK, Danforth KN, Rosner B, Curhan GC, Resnick NM, Grodstein F. Body mass index, weight gain, and incident urinary incontinence in middle-aged women. Obstet Gynecol. 2007 Aug.;110(2 Pt 1):346–353.

163. Bump RC, Sugerman HJ, Fantl JA, McClish DK. Obesity and lower urinary tract function in women: effect of surgically induced weight loss. Am. J. Obstet. Gynecol. 1992 Aug.;167(2):392–7; discussion 397–9.

164. Richter HE, Creasman JM, Myers DL, Wheeler TL, Burgio KL, Subak LL, et al. Urodynamic characterization of obese women with urinary incontinence undergoing a weight loss program: the Program to Reduce Incontinence by Diet and Exercise (PRIDE) trial. Int Urogynecol J. 2008 Aug. 5;19(12):1653–1658.

165. Tai H-C, Chung S-D, Ho C-H, Tai T-Y, Yang W-S, Tseng C-H, et al. Metabolic syndrome components worsen lower urinary tract symptoms in women with type 2 diabetes. J. Clin. Endocrinol. Metab. 2010 Mar.;95(3):1143–1150.

166. Uzun H, Zorba OU. Metabolic Syndrome in Female Patients With Overactive Bladder. Urology. 2011 Oct. 17.

167. Kirby MG, Wagg A, Cardozo L, Chapple C, Castro-Diaz D, De Ridder D, et al. Overactive bladder: Is there a link to the metabolic syndrome in men? Neurourol. Urodyn. 2010;29(8):1360–1364.

168. Kupelian V, McVary KT, Barry MJ, Link CL, Rosen RC, Aiyer, L. P., et al. Association of C-reactive Protein and Lower Urinary Tract Symptoms in Men and Women: Results From Boston Area Community Health Survey. Urology. 2009;73(5):950–957.

169. Link CL, Steers WD, Kusek JW, McKinlay JB. The association of adiposity and overactive bladder appears to differ by gender: results from the Boston Area Community Health survey. J. Urol. 2011 Mar.;185(3):955–963.

170. Kim I-H, Chun H, Kwon J-W. Gender differences in the effect of obesity on chronic diseases among the elderly Koreans. J. Korean Med. Sci. 2011 Feb.;26(2):250–257.

171. Subak LL, Whitcomb E, Shen H, Saxton J, Vittinghoff E, Brown JS. Weight loss: a novel and effective treatment for urinary incontinence. JURO. 2005 Jul.;174(1):190–195.

172. Subak LL, Wing R, West DS, Franklin F, Vittinghoff E, Creasman JM, et al. Weight loss to treat urinary incontinence in overweight and obese women. N. Engl. J. Med. 2009 Jan. 29;360(5):481–490.

173. Wing RR, West DS, Grady D, Creasman JM, Richter HE, Myers D, et al. Effect of weight loss on urinary incontinence in overweight and obese women: results at 12 and 18 months. J. Urol. 2010 Sep.;184(3):1005–1010.

174. Auwad W, Steggles P, Bombieri L, Waterfield M, Wilkin T, Freeman R. Moderate weight loss in obese women with urinary incontinence: a prospective longitudinal study. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Sep.;19(9):1251–1259.

175. Thomas TM, Plymat KR, Blannin J, Meade TW. Prevalence of urinary incontinence. Br Med J. 1980 Nov. 8;281(6250):1243–1245.

176. Holst K, Wilson PD. The prevalence of female urinary incontinence and reasons for not seeking treatment. N. Z. Med. J. 1988 Nov. 9;101(857):756–758.

177. Højberg KE, Salvig JD, Winsløw NA, Lose G, Secher NJ. Urinary incontinence: prevalence and risk factors at 16 weeks of gestation. Br J Obstet Gynaecol. 1999 Aug.;106(8):842–850.

178. Rortveit G, Hannestad YS, Daltveit AK, Hunskaar S. Age- and type-dependent effects of parity on urinary incontinence: the Norwegian EPINCONT study. Obstet Gynecol. 2001 Dec.;98(6):1004–1010.

179. Connolly TJ, Litman HJ, Tennstedt SL, Link CL, McKinlay JB. The effect of mode of delivery, parity, and birth weight on risk of urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct. 2007 Sep.;18(9):1033–1042.

180. Miller YD, Brown WJ, Russell A, Chiarelli P. Urinary incontinence across the lifespan. Neurourol. Urodyn. 2003;22(6):550–557.

181. Lukacz ES, Lawrence JM, Contreras R, Nager CW, Luber KM. Parity, mode of delivery, and pelvic floor disorders. Obstet Gynecol. 2006 Jun.;107(6):1253–1260.

182. Hirsch AG, Minassian VA, Dilley A, Sartorius J, Stewart WF. Parity is not associated with urgency with or without urinary incontinence. Int Urogynecol J. 2010 Sep.;21(9):1095–1102.

183. Press JZ, Klein MC, Kaczorowski J, Liston RM, Dadelszen von P. Does cesarean section reduce postpartum urinary incontinence? A systematic review. Birth. 2007 Sep.;34(3):228–237.

184. MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. BJOG: An International Journal of Obstetrics & Gynaecology. 2000 Dec.;107(12):1460–1470.

185. Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. Arch. Intern. Med. 2005 Mar. 14;165(5):537–542.

186. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S, Norwegian EPINCONT Study. Urinary incontinence after vaginal delivery or cesarean section. N. Engl. J. Med. 2003 Mar. 6;348(10):900–907.

187. Peyrat L, Haillot O, Bruyere F, Boutin JM, Bertrand P, Lanson Y. Prevalence and risk factors of urinary incontinence in young and middle-aged women. BJU Int. 2002 Jan.;89(1):61–66.

188. MacArthur C, Glazener C, Lancashire R, Herbison P, Wilson D, ProLong study group. Exclusive caesarean section delivery and subsequent urinary and faecal incontinence: a 12-year longitudinal study. BJOG: An International Journal of Obstetrics & Gynaecology. 2011 Jul.;118(8):1001–1007.

189. Viktrup L, Rortveit G, Lose G. Risk of stress urinary incontinence twelve years after the first pregnancy and delivery. Obstet Gynecol. 2006 Aug.;108(2):248–254.

190. Altman D, Ekström A, Gustafsson C, López A, Falconer C, Zetterström J. Risk of urinary incontinence after childbirth: a 10-year prospective cohort study. Obstet Gynecol. 2006 Oct.;108(4):873–878.

191. Gyhagen M, Bullarbo M, Nielsen TF, Milsom I. The prevalence of urinary incontinence 20 years after child birth: a national cohort study in singleton primiparae after vaginal or caesarean delivery. BJOG. 2012 Mar 14. doi: 10.1111/j.1471-0528.2012.03301.x. [Epub ahead of print].

192. Hannah ME, Whyte H, Hannah WJ, Hewson S, Amankwah K, Cheng M, et al. Maternal outcomes at 2 years after planned cesarean section versus planned vaginal birth for breech presentation at term: the international randomized Term Breech Trial. Am. J. Obstet. Gynecol. 2004 Sep.;191(3):917–927.

193. Thom DH, Rortveit G. Prevalence of postpartum urinary incontinence: a systematic review. Acta Obstet Gynecol Scand. 2010 Dec.;89(12):1511–1522.

194. Chaliha C, Kalia V, Stanton SL, Monga A, Sultan AH. Antenatal prediction of postpartum urinary and fecal incontinence. Obstet Gynecol. 1999 Nov.;94(5 Pt 1):689–694.

195. Eason E, Labrecque M, Marcoux S, Mondor M. Effects of carrying a pregnancy and of method of delivery on urinary incontinence: a prospective cohort study. BMC Pregnancy Childbirth. 2004 Feb. 19;4(1):4.

196. Eftekhar T, Hajibaratali B, Ramezanzadeh F, Shariat M. Postpartum evaluation of stress urinary inconti-

nence among primiparas. Int J Gynaecol Obstet. 2006 Aug.;94(2):114–118.

197. Ekström A, Altman D, Wiklund I, Larsson C, Andolf E. Planned cesarean section versus planned vaginal delivery: comparison of lower urinary tract symptoms. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Apr.;19(4):459–465.

198. Pregazzi R, Sartore A, Troiano L, Grimaldi E, Bortoli P, Siracusano S, et al. Postpartum urinary symptoms: prevalence and risk factors. Eur. J. Obstet. Gynecol. Reprod. Biol. 2002 Jul. 10;103(2):179–182.

199. Farrell SA, Allen VM, Baskett TF. Parturition and urinary incontinence in primiparas. Obstet Gynecol. 2001 Mar.;97(3):350–356.

200. Groutz A, Rimon E, Peled S, Gold R, Pauzner D, Lessing JB, et al. Cesarean section: does it really prevent the development of postpartum stress urinary incontinence? A prospective study of 363 women one year after their first delivery. Neurourol. Urodyn. 2004;23(1):2–6.

201. Glazener CMA, Herbison GP, MacArthur C, Lancashire R, McGee MA, Grant AM, et al. New postnatal urinary incontinence: obstetric and other risk factors in primiparae. BJOG: An International Journal of Obstetrics & Gynaecology. 2006 Feb.;113(2):208–217.

202. Schytt E, Lindmark G, Waldenström U. Physical symptoms after childbirth: prevalence and associations with self-rated health. BJOG: An International Journal of Obstetrics & Gynaecology. 2005 Feb.;112(2):210–217.

203. Borello-France D, Burgio KL, Richter HE, Zyczynski H, FitzGerald MP, Whitehead W, et al. Fecal and urinary incontinence in primiparous women. Obstet Gynecol. 2006 Oct.;108(4):863–872.

204. Marshall K, Thompson KA, Walsh DM, Baxter GD. Incidence of urinary incontinence and constipation during pregnancy and postpartum: survey of current findings at the Rotunda Lying-In Hospital. Br J Obstet Gynaecol. 1998 Apr.;105(4):400–402.

205. Mørkved S, Bø K. Prevalence of urinary incontinence during pregnancy and postpartum. Int Urogynecol J Pelvic Floor Dysfunct. 1999;10(6):394–398.

206. Foldspang A, Hvidman L, Mommsen S, Nielsen JB. Risk of postpartum urinary incontinence associated with pregnancy and mode of delivery. Acta Obstet Gynecol Scand. 2004 Oct.;83(10):923–927.

207. Hvidman L, Foldspang A, Mommsen S, Nielsen JB. Postpartum urinary incontinence. Acta Obstet Gynecol Scand. 2003 Jun.;82(6):556–563.

208. Aslan E, Beji NK, Erkan HA, Yalcin O, Gungor F. The prevalence of and the related factors for urinary and fecal incontinence among older residing in nursing homes. J Clin Nurs. 2009 Dec.;18(23):3290–3298.

209. Yang X, Zhang HX, Yu HY, Gao XL, Yang HX, Dong Y. The prevalence of fecal incontinence and urinary incontinence in primiparous postpartum Chinese women. Eur. J. Obstet. Gynecol. Reprod. Biol. 2010 Oct.;152(2):214–217.

210. Carroli G, Mignini L. Episiotomy for vaginal birth. Cochrane Database Syst Rev. 2009;(1):CD000081.

211. MacArthur C, Glazener CMA, Wilson PD, Lancashire RJ, Herbison GP, Grant AM. Persistent urinary incontinence and delivery mode history: a six-year longitudinal study. BJOG: An International Journal of Obstetrics & Gynaecology. 2006 Feb.;113(2):218–224.

212. Brown SJ, Gartland D, Donath S, MacArthur C. Effects of prolonged second stage, method of birth, timing of caesarean section and other obstetric risk factors on postnatal urinary incontinence: an Australian nulliparous cohort study. BJOG: An International Journal of Obstetrics & Gynaecology. 2011 Jul.;118(8):991–1000.

213. O'Mahony F, Hofmeyr GJ, Menon V. Choice of instruments for assisted vaginal delivery. Cochrane Database Syst Rev. 2010;(11):CD005455.

214. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Vaginal delivery parameters and urinary incontinence: the Norwegian EPINCONT study. Am. J. Obstet. Gynecol. 2003 Nov.;189(5):1268–1274.

215. Thom DH, van den Eeden SK, Brown JS. Evaluation of parturition and other reproductive variables as risk factors for urinary incontinence in later life. Obstet Gynecol. 1997 Dec.;90(6):983–989.

216. Thom DH, Brown JS, Schembri M, Ragins AI, Creasman JM, Van Den Eeden SK. Parturition events and risk of urinary incontinence in later life. Neurourol. Urodyn. 2011 Nov.;30(8):1456–1461.

217. Foldspang A, Mommsen S, Djurhuus JC. Prevalent urinary incontinence as a correlate of pregnancy, vaginal childbirth, and obstetric techniques. Am J Public Health. 1999 Feb.;89(2):209–212.

218. Persson J, Wolner-Hanssen P, Rydhstroem H. Obstetric risk factors for stress urinary incontinence: a population-based study. Obstet Gynecol. 2000 Sep.;96(3):440–445.

219. Rortveit G, Hunskaar S. Urinary incontinence and age at the first and last delivery: the Norwegian HUNT/EPINCONT study. Am. J. Obstet. Gynecol. 2006 Aug.;195(2):433–438.

220. Roe B, Doll H. Lifestyle factors and continence status: comparison of self-report data from a postal survey in England. J Wound Ostomy Continence Nurs. 1999 Nov.;26(6):312–3, 315–9.

221. Fenner DE, Trowbridge ER, Patel DA, Patel DL, Fultz NH, Miller JM, et al. Establishing the prevalence of incontinence study: racial differences in women's patterns of urinary incontinence. J. Urol. 2008 Apr.;179(4):1455–1460.

222. Townsend MK, Curhan GC, Resnick NM, Grodstein F. The incidence of urinary incontinence across Asian, black, and white women in the United States. Am. J. Obstet. Gynecol. 2010 Apr.;202(4):378.e1–7.

223. Fultz NH, Herzog AR, Raghunathan TE, Wallace RB, Diokno AC. Prevalence and severity of urinary incontinence in older African American and Caucasian women. J. Gerontol. A Biol. Sci. Med. Sci. 1999 Jun.;54(6):M299–303.

224. Nygaard I, Turvey C, Burns TL, Crischilles E, Wallace R. Urinary incontinence and depression in middle-aged United States women. Obstet Gynecol. 2003 Jan.;101(1):149–156.

225. Sampselle CM, Harlow SD, Skurnick J, Brubaker L, Bondarenko I. Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. Obstet Gynecol. 2002 Dec.;100(6):1230–1238.

226. Anger JT, Saigal CS, Litwin MS, Urologic Diseases of America Project. The prevalence of urinary incontinence among community dwelling adult women: results from the National Health and Nutrition Examination Survey. JURO. 2006 Feb.;175(2):601–604.

227. Jackson RA, Vittinghoff E, Kanaya AM, Miles TP, Resnick HE, Kritchevsky SB, et al. Urinary incontinence in elderly women: findings from the Health, Aging, and Body Composition Study. Obstet Gynecol. 2004 Aug.;104(2):301–307.

228. Dooley Y, Kenton K, Cao G, Luke A, Durazo-Arvizu R, Kramer H, et al. Urinary incontinence prevalence: results from the National Health and Nutrition Examination Survey. J. Urol. 2008 Feb.;179(2):656–661.

229. Markland AD, Gerety MB, Goode PS, Kraus SR, Cornell J, Hazuda HP. Urinary incontinence in community-dwelling older Mexican American and European American women. Arch Gerontol Geriatr. 2009 Feb.;48(2):232–237.

230. Markland AD, Goode PS, Burgio KL, Redden DT, Richter HE, Sawyer P, et al. Correlates of urinary, fecal, and dual incontinence in older African-American and white men and women. J Am Geriatr Soc. 2008 Feb.;56(2):285–290.

231. Fantl JA, Cardozo L, McClish DK. Estrogen therapy in the management of urinary incontinence in postmenopausal women: a meta-analysis. First report of the Hormones and Urogenital Therapy Committee. Obstet Gynecol. 1994 Jan.;83(1):12–18.

232. Diokno AC, Brock BM, Herzog AR, Bromberg J. Medical correlates of urinary incontinence in the elderly. URL. 1990 Aug.;36(2):129–138.

233. Cody JD, Richardson K, Moehrer B, Hextall A, Glazener CM. Oestrogen therapy for urinary incontinence in postmenopausal women. Cochrane Database Syst Rev. 2009;(4):CD001405.

234. Grodstein F, Lifford K, Resnick NM, Curhan GC. Postmenopausal hormone therapy and risk of developing urinary incontinence. Obstet Gynecol. 2004 Feb.;103(2):254–260.

235. Grady D, Brown JS, Vittinghoff E, Applegate W, Varner E, Snyder T, et al. Postmenopausal hormones and incontinence: the Heart and Estrogen/Progestin Replacement Study. Obstet Gynecol. 2001 Jan.;97(1):116–120.

236. Hendrix SL, Cochrane BB, Nygaard IE, Handa VL, Barnabei VM, Iglesia C, et al. Effects of estrogen with and without progestin on urinary incontinence. JAMA. 2005 Feb. 23;293(8):935–948.

237. Goldstein SR, Johnson S, Watts NB, Ciaccia AV, Elmerick D, Muram D. Incidence of urinary incontinence in postmenopausal women treated with raloxifene or estrogen. Menopause. 2005 Mar.;12(2):160–164.

238. Albertazzi P, Sharma S. Urogenital effects of selective estrogen receptor modulators: a systematic review. Climacteric. 2005 Sep.;8(3):214–220.

239. Hsieh C-H, Chang W-C, Lin T-Y, Su T-H, Li Y-T, Kuo T-C, et al. Long-term effect of hysterectomy on urinary incontinence in Taiwan. Taiwanese Journal of Obstetrics & Gynecology. Elsevier Taiwan LLC; 2011 Sep. 1;50(3):326–330.

240. Moghaddas F, Lidfeldt J, Nerbrand C, Jernström H, Samsioe G. Prevalence of urinary incontinence in relation to self-reported depression, intake of serotonergic antidepressants, and hormone therapy in middle-aged women: a report from the Women's Health in the Lund Area study. Menopause. 2005 Apr.;12(3):318–324.

241. Forsgren C, Lundholm C, Johansson ALV, Cnattingius S, Zetterström J, Altman D. Vaginal hysterectomy and risk of pelvic organ prolapse and stress urinary incontinence surgery. Int Urogynecol J. 2011 Aug. 18.

242. Bhattacharya S, Middleton LJ, Tsourapas A, Lee AJ, Champaneria R, Daniels JP, et al. Hysterectomy, endometrial ablation and Mirena® for heavy menstrual bleeding: a systematic review of clinical effectiveness and cost-effectiveness analysis. Health Technol Assess. 2011 Apr.;15(19):iii–xvi, 1–252.

243. Heliövaara-Peippo S, Halmesmäki K, Hurskainen R, Teperi J, Grenman S, Kivelä A, et al. The effect of hysterectomy or levonorgestrel-releasing intrauterine system on lower urinary tract symptoms: a 10-year follow-up study of a randomised trial. BJOG: An International Journal of Obstetrics & Gynaecology. 2010 Apr.;117(5):602–609.

244. Arya LA, Myers DL, Jackson ND. Dietary caffeine intake and the risk for detrusor instability: a case-control study. Obstet Gynecol. 2000 Jul.;96(1):85–89.

245. Martins G, Soler ZASG, Cordeiro JA, Amaro JL, Moore KN. Prevalence and risk factors for urinary incontinence in healthy pregnant Brazilian women. Int Urogynecol J. 2010 Oct.;21(10):1271–1277.

246. Bortolotti A, Bernardini B, Colli E, Di Benedetto P, Giocoli Nacci G, Landoni M, et al. Prevalence and risk factors for urinary incontinence in Italy. Eur. Urol. 2000 Jan.;37(1):30–35.

247. Tettamanti G, Altman D, Pedersen NL, Bellocco R, Milsom I, Iliadou AN. Effects of coffee and tea consumption on urinary incontinence in female twins. BJOG: An International Journal of Obstetrics & Gynaecology. 2011 Jun.;118(7):806–813.

248. Jura YH, Townsend MK, Curhan GC, Resnick NM, Grodstein F. Caffeine intake, and the risk of stress, urgency and mixed urinary incontinence. J. Urol. 2011 May;185(5):1775–1780.

249. Schmidbauer J, Temml C, Schatzl G, Haidinger G, Madersbacher S. Risk factors for urinary incontinence in both sexes. Analysis of a health screening project. Eur. Urol. 2001 May;39(5):565–570.

250. Teleman PM, Lidfeldt J, Nerbrand C, Samsioe G, Mattiasson A, WHILA study group. Overactive bladder: prevalence, risk factors and relation to stress incontinence in middle-aged women. BJOG: An International Journal of Obstetrics & Gynaecology. 2004 Jun.;111(6):600–604.

251. Huang AJ, Brown JS, Kanaya AM, Creasman JM, Ragins AI, Van Den Eeden SK, et al. Quality-of-life impact and treatment of urinary incontinence in ethnically diverse older women. Arch. Intern. Med. 2006 Oct. 9;166(18):2000–2006.

252. Kraus SR, Markland A, Chai TC, Stoddard A, FitzGerald MP, Leng W, et al. Race and ethnicity do not contribute to differences in preoperative urinary incontinence severity or symptom bother in women who undergo stress incontinence surgery. Am. J. Obstet. Gynecol. 2007 Jul.;197(1):92.e1–6.

253. Saadoun K, Ringa V, Fritel X, Varnoux N, Zins M, Bréart G. Negative impact of urinary incontinence on quality of life, a cross-sectional study among women aged 49-61 years enrolled in the GAZEL cohort. Neurourol. Urodyn. 2006;25(7):696–702.

254. Roe B, Doll H. Prevalence of urinary incontinence and its relationship with health status. J Clin Nurs. 2000 Mar.;9(2):178–187.

255. Coyne KS, Kaplan SA, Chapple CR, Sexton CC, Kopp ZS, Bush EN, et al. Risk factors and comorbid conditions associated with lower urinary tract symptoms: EpiLUTS. BJU Int. 2009 Apr.;103 Suppl 3:24–32.

256. Kim H, Yoshida H, Hu X, Yukawa H, Shinkai S, Kumagai S, et al. [Risk factors associated with onset of urinary incontinence in a community-dwelling elderly population: a 4-year follow-up study]. Nihon Koshu Eisei Zasshi. 2004 Aug.;51(8):612–622.

257. Waetjen LE, Feng W-Y, Ye J, Johnson WO, Greendale GA, Sampselle CM, et al. Factors associated with worsening and improving urinary incontinence across the menopausal transition. Obstet Gynecol. 2008 Mar.;111(3):667–677.

258. Nygaard IE, Thompson FL, Svengalis SL, Albright JP. Urinary incontinence in elite nulliparous athletes. Obstet Gynecol. 1994 Aug.;84(2):183–187.

259. Simeone C, Moroni A, Pettenò A, Antonelli A, Zani D, Orizio C, et al. Occurrence rates and predictors of lower urinary tract symptoms and incontinence in female athletes. Urologia. 2010 Mar.;77(2):139–146.

260. Eliasson K, Larsson T, Mattsson E. Prevalence of stress incontinence in nulliparous elite trampolinists. Scand J Med Sci Sports. 2002 Apr.;12(2):106–110.

261. Eliasson K, Edner A, Mattsson E. Urinary incontinence in very young and mostly nulliparous women with a history of regular organised high-impact trampoline training: occurrence and risk factors. Int Urogynecol J Pelvic Floor Dysfunct. 2008 May;19(5):687–696.

262. Nygaard I, Girts T, Fultz NH, Kinchen K, Pohl G, Sternfeld B. Is urinary incontinence a barrier to exercise in women? Obstet Gynecol. 2005 Aug.;106(2):307–314.

263. Bø K, Mørkved S, Frawley H, Sherburn M. Evidence for benefit of transversus abdominis training alone or in combination with pelvic floor muscle training to treat female urinary incontinence: A systematic review. Neurourol. Urodyn. 2009;28(5):368–373.

264. Van Oyen H, Van Oyen P. Urinary incontinence in Belgium; prevalence, correlates and psychosocial consequences. Acta Clin Belg. 2002 Jun.;57(4):207–218.

265. Zhu L, Lang J, Wang H, Han S, Huang J. The prevalence of and potential risk factors for female urinary incontinence in Beijing, China. Menopause. 2008 May;15(3):566–569.

266. Eliasson K, Nordlander I, Larson B, Hammarström M, Mattsson E. Influence of physical activity on urinary leakage in primiparous women. Scand J Med Sci Sports. 2005 Apr.;15(2):87–94.

267. Danforth KN, Shah AD, Townsend MK, Lifford KL, Curhan GC, Resnick NM, et al. Physical activity and urinary incontinence among healthy, older women. Obstet Gynecol. 2007 Mar.;109(3):721–727.

268. McGrother CW, Donaldson MMK, Hayward T, Matthews R, Dallosso HM, Hyde C, et al. Urinary storage symptoms and comorbidities: a prospective population cohort study in middle-aged and older women. Age Ageing. 2006 Jan.;35(1):16–24.

269. Ebbesen MH, Hannestad YS, Midthjell K, Hunskaar S. Diabetes and urinary incontinence - prevalence data from Norway. Acta Obstet Gynecol Scand. 2007 Sep. 4;:1–7.

270. Ebbesen MH, Hannestad YS, Midthjell K, Hunskaar S. Diabetes related risk factors did not explain the increased risk for urinary incontinence among women with diabetes. The Norwegian HUNT/EPINCONT study. BMC Urol. 2009;9:11.

271. Sarma AV, Kanaya AM, Nyberg LM, Kusek JW, Vittinghoff E, Rutledge B, et al. Urinary incontinence among women with type 1 diabetes--how common is it? J. Urol. 2009 Mar.;181(3):1224–30; discussion 1230.

272. Brown JS, Vittinghoff E, Lin F, Nyberg LM, Kusek JW, Kanaya AM. Prevalence and risk factors for urinary incontinence in women with type 2 diabetes and impaired fasting glucose: findings from the National Health and Nutrition Examination Survey (NHANES) 2001-2002. Diabetes Care. 2006 Jun.;29(6):1307–1312.

273. Moore EE, Jackson SL, Boyko EJ, Scholes D, Fihn SD. Urinary incontinence and urinary tract infection: temporal relationships in postmenopausal women. Obstet Gynecol. 2008 Feb.;111(2 Pt 1):317–323.

274. Herzog AR, Fultz NH. Prevalence and incidence of urinary incontinence in community-dwelling populations. J Am Geriatr Soc. 1990 Mar.;38(3):273–281.

275. Brown J, Grady D, Ouslander J. Prevalence of urinary incontinence and associated risk factors in postmenopausal women. Heart & Estyrogen/Progestin Replacement Study (HERS) Research group. Obstet Gynecol 1999;94:66-70.

276. Caljouw MAA, Elzen den WPJ, Cools HJM, Gussekloo J. Predictive factors of urinary tract infections among the oldest old in the general population. A population-based prospective follow-up study. BMC Med. 2011;9:57.

277. Ouslander JG, Uman GC, Urman HN, Rubenstein LZ. Incontinence among nursing home patients: clinical and functional correlates. J Am Geriatr Soc. 1987 Apr.;35(4):324–330.

278. Østbye T, Borrie MJ, Hunskaar S. The prevalence of urinary incontinence in elderly Canadians and its association with dementia, ambulatory function, and institutionalization. Norsk epidemiologi. 2009;8(2).

279. Huang AJ, Brown JS, Thom DH, Fink HA, Yaffe K, Study of Osteoporotic Fractures Research Group. Urinary incontinence in older community-dwelling women: the role of cognitive and physical function decline. Obstet Gynecol. 2007 Apr.;109(4):909–916.

280. Thom D, Haan M, van den Eeden S. Medically recognized urinary incontinence and risks of hospitalization, nursing home admission and mortality. Age Ageing. 1997;26:367–374.

281. Pinner G, Johnson H, Bouman WP, Isaacs J. Psychiatric manifestations of normal-pressure hydrocephalus: a short review and unusual case. Int Psychogeriatr. 1997 Dec.;9(4):465–470.

282. Akiguchi I, Ishii M, Watanabe Y, Watanabe T, Kawasaki T, Yagi H, et al. Shunt-responsive parkinsonism and reversible white matter lesions in patients with idiopathic NPH. J. Neurol. 2008 Sep.;255(9):1392–1399.

283. Palmer MH, Hardin SR, Behrend C, Collins SK-R, Madigan CK, Carlson JR. Urinary incontinence and overactive bladder in patients with heart failure. J. Urol. 2009 Jul.;182(1):196–202.

284. Ekundayo OJ, Markland A, Lefante C, Sui X, Goode PS, Allman RM, et al. Association of diuretic use and overactive bladder syndrome in older adults: a propensity score analysis. Arch Gerontol Geriatr. 2009 Jun.;49(1):64–68.

285. Nuotio M, Jylhä M, Luukkaala T, Tammela TLJ. Urinary incontinence in a Finnish population aged 70 and over. Prevalence of types, associated factors and self-reported treatments. Scand J Prim Health Care. 2003 Sep.;21(3):182–187.

286. Thom D. : Variations in estimated of urinary incontinence prevalence in the community: Effects of Differences in Definitions, Population Characteristics, and Study Type. J. Amer Geriatrics Society, 46: 473, 1998.

287. Koyama W, Koyanagi A, Mihara S, Kawazu S, Uemura T, Nakano H et al. : Prevalence and conditions or urinary incontinenc among the elderly. Methods Inf Med, 37: 151, 1998.

288. Boyle P, Boyle P, Robertson C, Mazzetta C, Keech M, Hobbs FD, Fourcade R, Kiemeney L, Lee C; The UrEpik Study Group. : The prevalence of male urinary incontinence in four centres: the UREPIK study. BJU Int., 92 : 943, 2003.

289. Engstrom G, Walker-Engstrom ML, Loof L, Leppert J. : Prevalence of three lower urinary tract symptoms in men - a population-based study. Fam Pract, 20 : 7, 2003 .

290. Van Oyen H, Van Oyen P.: Urinary incontinence in Belgium; prevalence, correlates and psychosocial consequences. Acta Clin Belg., 57: 207, 2002.

291. Schmidbauer J, Temml C, Schatzl G, Haidinger G, Madersbacher S.: Risk factors for urinary incontinence in both sexes. Analysis of a health screening project. Eur Urol., 39: 565, 2001.

292. Maral I, Ozkardes H, Peskircioglu L, and Bumin MA. : Prevalence of stress urinary incontinence in both sexes at or after age 15 years: a cross-sectional study. J Urol., 165: 408, 2001.

293. Bortolotti A., Bernardini B., Colli, E., Dibendetto, P., Nacci, G.G., Landoni, M. et al : Prevalence and risk factors for urinary incontinence in Italy. Eur. Urol., 37: 30, 2000.

294. Smoger SH, Felice TL, and Kloecker GH. : Urinary incontinence among male veterans receiving care in primary care clinics. Ann Intern Med., 132: 547, 2000.

295. Ueda T, Tamaki M, Kageyama S, Yoshimura N, and Yoshida O. : Urinary incontinence among community-dwelling people aged 40 years or older in Japan: prevalence, risk factors, knowledge and self-perception. Int J Urol., 7: 95, 2000.

296. Roberts RO, Jacobsen SJ, Reilly WT, Pemberton JH, Lieber MM, and Talley NJ.: Prevalence of combined fecal and urinary incontinence: a community-based study. J Am Geriatr Soc., 47: 837, 1999.

297. Roberts RO, Jacobsen SJ, Rhodes T, Reilly WT, Girman CJ, Talley NJ, and Lieber MM. : Urinary incontinence in a community-based cohort: prevalence and healthcare-seeking. J Am Geriatr Soc., 46: 467,1998.

298. Schulman C, Claesm H, and Mattijs J: Urinary incontienence in Belgium: a population-based epidemiological survey. Eur. Urol., 32: 315, 1997.

299. Malmsten UG, Milsom I, Molander U, and Norlen LJ.: Urinary incontinence and lower urinary tract symptoms: an epidemiological study of men aged 45-99 years. J Urol., 158: 1733, 1997.

300. Brocklehurst JC. Urinary incontinence in the community – analysis of a MORI poll. BMJ 306: 832-4, 1993.

301. Irwin DE, Milsom I, Hunskaar S, Reilly K, Kopp Z, Herschorn S, et al., Population-based survey of urinary incontinence, overactive bladder and other lower urinary tract symptoms in five countries : Results of the EPIC study. Eur Urol 50m 1306-15, 2006.

302. Lagace EA, Hansen W, and Hickner JM. Prevalence and severity of urinary incontinence in ambulatory adults : an UPRNet study. J fam Pract 36(6): 610-5, 1993.

303. McGrother CW, Donaldson MMK, Shaw C, Matthews RJ, Hayward TA, Dallosso HM, Jagger c, et al. Storage symptoms of the bladder : prevalence, incidence and need for services in the UK. BJU Int 93: 763-69, 2004.

304. O Brien J, Austin M, Sethi P, and O'Boyle P : Urinary incontinence : prevalence , need for treatment, and effectiveness of intervention by nurse. BMJ, 303: 1308-12, 1991.

305. Parrazzini F, Lavezzari M, and Artibani W. Prevalence of overactive bladder and urinary incontinence. J Fam Pract 5:1072-4, 2002.

306. Roe B. Prevalence of urinary incontinence and its relationship with health status. J Clin Nursing 9: 178-88, 2000.

307. Markland AD, Richter HE, Fwu CW, Eggers P, Kusek JW. Prevalence and trends of urinary incontinence in adults in the United States,2001 to 2008.J urol 2011 Aug; 186(2): 589-93

308. Markland AD, Goode PS, Redden DT, Borrud LG, Burgio KL. Prevalence of urinary incontinence in men: results from the national health and nutrition examination survey. J Urol 2010 Sep; 184(3):1022-7

309. de Souza Santos CR, Santos VL. Prevalence of urinary incontinence in a random sample of the urban population of Pouso Alegre, Minas Gerais, Brazil.Rev Lat Am Enfermagem. 2010 Sep-Oct;18(5):903-10

310. Finkelstein MM. Medical conditions, medications and urinary incontinence. Analysis of a population-based survey. Can Fam Physician 2001; 48:96-101

311. Diokno AC, Estanol MVC, Ibrahim IA, and Balasubamanian M. Prevalence of urinary incontiennce in community dwelling men : a cross sectional nationwide epidemiology survey. Int Urol Nephrol 39: 129-36, 2007.

312. Lee YS, Lee KS, Jung JH, Han DH, Oh SJ, Seo JT, Lee JG, Park HS, Choo MS Prevalence of overactive bladder, urinary incontinence, and lower urinary tract symptoms: results of Korean EPIC study.World J Urol 2011 Apr; 29(2): 185-90

313. Espuña-Pons M, Brugulat Guiteras P, Costa Sampere D, Medina Bustos A, Mompar. Prevalence of urinary incontinence in Catalonia, Spain. Penina A. Med Clin (Barc). 2009 Nov 14;133(18):702-5

314. Diokno, A.C., Brock, B.M., Brown, M.B., and Herzog, R. : Prevalence of urinary incontinence and other urological symptoms in the non-institutionalized elderly. J. Urol., 136: 1022, 1986.

315. Dios-Diz JM, Rodriguez-Lama M, Martinez-Calvo JR, Rodriguez-Perez C, Melero-Brezo M, Garcia-Cepeda JR. : [Prevalence of urinary incontinence in the population aged more than 64 years in Galicia, Spain]. Gac Sanit, 17 : 409, 2003.

316. Stoddart H, Donovan J, Whitley E, Sharp D, and Harvey I. : Urinary incontinence in older people in the community: a neglected problem? Br J Gen Pract., 51: 548, 2001.

317. Aggazzotti G, Pesce F, Grassi D, Fantuzzi G, Righi E, De Vita D, Santacroce S., and Artibani W.: Prevalence of urinary incontinence among institutionalized patients: a cross-sectional epidemiologic study in a midsized city in northern Italy. Urology, 56: 245, 2000.

318. Gavira Iglesias FJ, Caridad y Ocerin JM, Perez del Molino Martin J, Valderrama Gama E, Lopez Perez M, Romero Lopez M, et al. : Prevalence and psychosocial impact of urinary incontinence in older people of a Spanish rural population. J Gerontol A Biol Sci Med Sci., 55 : M207, 2000.

319. Damian J., Martin-Moreno, J.M., Lobo F., Bonache J., Cervino J., Redondo-Marquez, L., et al.: Prevalence of urinary incontinence among Spanish older people living at home. Eur. Urol., 34: 333, 1998.

320. Umlauf MG, AND Sherman SM.: Symptoms of urinary incontinence among older community-dwelling men.J Wound Ostomy Continence Nurs., 23: 314, 1996.

321. Nuotio M, Jylha M, Luukkaala T, and Tammela TL. : Urinary incontinence in a Finnish population aged 70 and over. Prevalence of types, associated factors and self-reported treatments. Scand J Prim Health Care., 21: 182, 2003.

322. Herzog, AR and Fultz NH.: Epidemiology of urinary incontinence: prevalence, incidence and correlates in community populations. Urology Suppl., 36: 2, 1990.

323. Janssen I. Morbidity and mortality risk associated with an overweight BMI in older women and women. Obesity 17: 1827-80, 2007.

324. Landi F, Cesari M, Russo A, Onder G, Lattansio F, Bernabe R, Silvernet-HC Study group. Potentially reversible risk factors and urinary incontinence in frail older people living in community. Age and Ageing 32: 194-9, 2003.

325. Thom C, Haan MN, and Van Den Eeden SK. Medically recognized urinary incontinence and risks of hospitalization, nursing home admission and mortality. Age and Ageing 26(5) : 367-9,1997.

326. Kwong PW, Cumming RG, Chan L, Seibel MJ, Naganathan V, Creasey H, Le Couteur D, Waite LM, Sambrook PN, Handelsman D. Urinary incontinence and quality of life among older community-dwelling Australian men: the CHAMP study.Age Ageing. 2010 May;39(3):349-54

327. Smith AL, Wang PC, Anger JT, Mangione CM, Trejo L, Rodríguez LV, Sarkisian CA. Correlates of urinary incontinence in community-dwelling older Latinos. J Am Geriatr Soc 2010 Jun; 58(6):1170-6

328. Yu PL. Shi J, Liu XR, Xia CW, Liu DF, Wu ZL, Sun ZQ. Zhonghua Liu Xing Bing Xue Za Zhi. 2009 Aug;30(8):766-71

329. Yarnell JW, and St Lege AS.: The prevalence, severity and factors associated with urinary incontinence in a random sample of the elderly. Age Ageing, 8: 81, 1979.

330. Thomas TM, Plymat KR, Blannin J and Meade TW: Prevalence of urinary incontinence. BMJ., 281:1243, 1980.

331. Temml, C., Haidinger, G., Schmidbauer, J., Schatzl, G., and Madershbacher, S.: Urinary incontinence in both sexes: Prevalence rates and impact on quality of life and sexual life. Nuerourol. Urodyn., 19: 259, 2000.

332. Marriapan P and Chong WL. Prevalence and correlations of lower urinary tract symptoms, erectile dysfunction and incontinence in men from a multiethnic Asian population : results of a regional population-based survey and comparison with industrialized nations. BJU Int 98: 1264-8, 2006.

333. Shamliyan TA, Wyman JF, Ping R, Wilt TJ, Kane RL. Male urinary incontinence: prevalence, risk factors, and preventive interventions. Rev Urol 2009 Summer ; 11(3): 145-65

334. Chaojie L, and Andrews GR. Prevalence and incidence of urinary incontinence in the elderly : a longitudinal study in South Australia. Chinese Med J 115(1) : 119-22, 2002.

335. Irwin DE, Milsom I, Hunskaar S, Reilly K, Kopp Z, Herschorn S, Coyne K, Kelleher C, Hampel C, Artibani W, Abrams P. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. Eur Urol 50 (6), 1306-14, Dec 2006.

336. Herschorn A, Gajewski J, Schulz J, and Corcos J : A population-based study of urinary symptoms and incontninence : the Canadian urinary bladder survey. BJU Int 101: 52-8, 2007.

337. Sladden MJ, Hughes AM, Hirst GH, and Ward JE.: A community study of lower urinary tract symptoms in older men in Sydney, Australia. Aust N.Z. J. Surg, 70: 322, 2000.

338. Muscatello DJ, Rissel C, and Szonyi G. Urinary symptoms and incontinence in an urban community prevalence and associated factors in older men and women. Int Med J 31:151-160, 2001.

339. Nelson RL, and Furner SE. Risk factors for the development of fecal and urinary incontinence in Winconsin nursing home residents. Maturitas 52: 26-31, 2005.

340. Kikuchi A, Niu K, Ikeda Y, Hozawa A, Nakagawa H, Guo H, Ohmori-Marsuda K, et al. Association between physical activity and urinary incontinence in a community-based elderly population aged 70 years and over. Eur Urol 52: 868-75, 2007.

341. Resnick NM and Yalla SV.: Detrusor hyperactivity with impaired contractile function : an unrecognized but common cause of incontinence in elderly patients. JAMA., 257: 3076, 1987.

342. Patel M, Coshall C, Rudd AG, and Wolfe CD.: Natural history and effects on 2-year outcomes of urinary incontinence after stroke. Stroke, 32 (1): 122-7, 2001.

343. Hunskaar S.: One hundred and fifty men with urinary incontinence. I. Demography and medical history. Scan. J. Prim. Health Care, 10: 21, 1992.

344. Malmsten UG, Molander U, Peeker R, Irwin DE, Milsom I. Urinary incontinence, overactive bladder, and other lower urinary tract symptoms: a longitudinal population-based survey in men aged 45-103 years.Eur Urol 2010 Jul 58(1): 149-56

345. Diokno A, Brock B, Hersog A, and Bromberg J: Medical correlates of urinary incontinence in the elderly. Urology, 36: 129, 1990.

346. van Melick HH, van Venrooij GE, Eckhardt MD, and Boon TA.: A randomized controlled trial comparing transurethral resection of the prostate, contact laser prostatectomy and electrovaporization in men with benign prostatic hyperplasia: analysis of subjective changes, morbidity and mortality. J Urol., 169: 1411, 2003.

347. Demirkesen O, Onal B, Tunc B, Alici B, Onder AU, Ozalp AU, Cetinel B.. Assessment of the continence status and patients' satisfaction after retropubic radical prostatectomy: a questionnaire based study. Int Urol Nephrol. 39(2):531-6, 2007.

348. Kundu SD, Roehl KA, Eggender SE, Antenor JV, Han M and Catalona WJ. Potency, continence and complications in 3477 consecutive radical retropubic prostatectomies. J Urol 172: 2227-2231, dec 2004.

349. Salomon L, Saint F, Anastasiadis AG, Sebe P, Chopin D, Abbou CC.: Combined reporting of cancer control and functional results of radical prostatectomy. Eur Urol., 44: 656, 2003

350. Moinzadeh A, Shunaigat AN, and Libertino JA.: Urinary incontinence after radical retropubic prostatectomy: the outcome of a surgical technique. BJU Int., 92: 355, 2003.

351. Maffezzini M, Seveso M, Taverna G, Giusti G, Benetti A, and Graziotti P.: Evaluation of complications and results in a contemporary series of 300 consecutive radical retropubic prostatectomies with the anatomic approach at a single institution. Urology, 61: 982, 2003.

352. Deliveliotis C, Protogerou V, Alargof E, and Varkarakis J.: Radical prostatectomy: bladder neck preservation and puboprostatic ligament sparing--effects on continence and positive margins. Urology, 60: 855, 2002.

353. Benoit RM, Naslund MJ, and Cohen JK.: Complications after radical retropubic prostatectomy in the medicare population. Urology, 56: 116, 2000.

354. Walsh PC, Marschke P, Ricker D and Burnett AL.: Patient-reported urinary continence and sexual function after anatomic radical prostatectomy. Urology, 55: 58, 2000.

355. Poon M, Ruckle H, Bamshad DBR, Rsai C, Webster R, and Lui P.: Radical retropubic prostatectomy : bladder neck preservation versus reconstruction. J. Urol., 163: 194, 2000.

356. Catalona WJ, Carvalhal GF, Mager DE, and Smith DS.: Potency, continence and complication rates in 19870 consecutive radical retropubic prostatectomies. J. Urol., 162: 433, 1999.

357. Horie S, Tobisu KI, Fujimoto H, Doi N. and Kakizoe T.: Urinary incontinence after non-nervesparing radical prostatectomy with neoadjuvant androgen deprivation. Urology, 53: 561, 1999.

358. Goluboff ET, Saidi JA, Mazer S, Bagiella E, Heitjan DF, Benson MC. Et. Al.: Urinary continence after radical prostatectomy: The Columbia experience. J. Urol., 159: 1276, 1998.

359. Weldon VE, Tavel FR, and Neuwirth H. : Continence, potency and morbidity after radical perineal prostatectomy. J Urol., 158: 1470, 1997.

360. Lowe BA. : Comparison of bladder neck preservation to bladder neck resection in maintaining postprostatectomy urinary incontinence. Urology, 48: 889, 1996.

361. Hu JC, Gold KF, Pashos CL, Mehta SS, and Litwin MS.: Temporal trends in radical prostatectomy complications from 1991 to 1998. J Urol, 169: 1443, 2003.

362. Augustin H, Pummer K, Daghofer F, Habermann H, Primus G, and Hubmer G. : Patient self-reporting questionnaire on urological morbidity and bother after radical retropubic prostatectomy. Eur Urol., 42: 112, 2002.

363. Sebesta M, Cespedes RD, Luhman E, Optenberg S, and Thompson IM.: Questionnaire-based outcomes of urinary incontinence and satisfaction rates after radical prostatectomy in a national study population. Urology, 60: 1055, 2002.

364. Potosky, A.L., Legler, J., Albertsen, P.C., Stanford, J.L., Gilliland, F.D., Hamilton, A.S., Eley, J.W., Stephenson, R.A., Harlan, L.C.: Health outcomes after prostatectomy or radiotherapy for prostate cancer : results from the Prostate Cancer Outcomes Study. J Natl Cancer Inst, 92: 1582, 2000.

365. Arai Y, Okubo K, Aoki Y, Maekawa S, Okada T, Maeda H, Ogawa O, and Kato T. : Patient-reported quality of life after radical prostatectomy for prostate cancer. Int J Urol., 6: 78, 1999.

366. Bishoff JT, Motley G., Optenberg SA, Stein CR, Moon KA, Browning SM. Et al.: Incidence of fecal and urinary incontinence following radical perineal and retropubic prostatectomy in a national population. J. Urol., 160: 454, 1998.

367. Egawa S, Minei S, Iwamura M, Uchida T, and Koshiba K. : Urinary continence following radical prostatectomy. Jpn J Clin Oncol., 27: 71, 1997.

368. Gray M, Petroni GR, and Theodorescu D.: Urinary function after radical prostatectomy: a comparison of the retropubic and perineal approaches. Urology, 53: 881, 1999.

369. Olsson LE, Salomon L, Nadu A, Hoznek A, Cicco A, Saint F, Chopin D, and Abbou CC. : Prospective patient-reported continence after laparoscopic radical prostatectomy. Urology, 58: 570, 2001.

370. LaFontaine P, Chan D, Partin AW, Gurganus R, Hortopan SC, and Marshall FF. : Minilaparotomy radical retropubic prostatectomy: updated technique and results. Semin Urol Oncol., 18: 19, 2000.

371. Galli S, Simonato A, Bozzola A, Gregori A, Lissiani A, Scaburri A, Gabardi F. Oncologic outcome and continence revcovery after laparoscopic radical prostatectomy: 3 years' follow-up in a "second generation center'. Eur Urol 49 : 859-865, 2006.

372. McKammon KA, Kolm P, Main B, and Schellhammer PF: Comparative quality of life analysis after radical retropubic prostatectomy: objective and subjective analysis. Urology, 49: 225, 1997.

373. Donnellan SM, Duncan HJ., MacGregor RJ., and Russel, JM. : Prospectiveassessment of incontinence after radical retropubic prostatectomy: objective and subjective analysis. Urology 49: 225, 1997.

374. Ojdeby G, Claezon A, Brekkan E, Haggman M, and Norlen BJ: Urinary incontinence and sexual impotence after radical prostatectomy. Scand. J. Urol. Nephrol., 30: 473, 1996.

375. Saranchuk JW, Kattan MW, Elkin E, Taurier K, Scardino PT, and Eastham, JA. Achieving optimal outcomes after radical prostatectomy. J Clin Oncol 23 (18) : 4146-51, June 2005.

376. Harris MJ. The anatomic radical perineal prostatectomy : An outcomes-based evolution. Eur Urol 52 : 81-88, 2007.

377. Jaconsen NB, Moore KN, Estey E, and Voaklander D. Open versus laparoscopic radical prostatectomy : A prostective comparison of postoperative urinary incontinence rates. J Urol, 177 : 615-619, Feb 2007.

378. Link RE, Su LM, Sullivan W, Bhayani S, and Pavlovich CP. Health related quality of life before and after laparoscopic radical prostatectomy. J Urol 173 : 173-9, January 2005.

379. Jonler M, Madsen FA, Rhodes PR, Sall M, Messing EM, Brusketwitz RB. A prospective study of quantification of urinary incontinence and quality of life in patients undergoing radical retropubic prostatectomy. Urology 48 : 433-40, 1996.

380. Penson DF, McLerran D, Feng Z, Li L, Albertsen PC, Gilland FD et al. 5-year urinary and sexual outcomes after radical prostatectomy : Results from the prostate cancer outcomes study. J Urol 173:1701-5, May 2005.

381. Wei JT, Dunn RL, Marcovich R, Montie JE, and Sanda MG.: Prospective assessment of patient reported urinary continence after radical prostatectomy. J Urol., 164: 744, 2000.

382. Eastham JA, Kattan MW, Rogers E, Goan JR, Ohori M, Boone TB, and Scardino PT.: Risk factors for urinary incontinence after radical prostatectomy. J Urol., 156: 1707, 1996.

383. Van Kampen M, De Weerdt W, Van Poppel H, Castell Campesino A., Stragier J. and Baert, L.: Prediction of urinary continence following radical prostatectomy. Urol. Int., 60: 80, 1998.

384. Srougi M, Nesrallah LJ, Kauffmann JR, Nesrallah A, and Leite KR.: Urinary continence and pathological outcome after bladder neck preservation during radical retropubic prostatectomy: a randomized prospective trial. J Urol., 165: 815, 2001.

385. Noh C, Kshirsagar A, and Mohler JL.: Outcomes after radical retropubic prostatectomy. Urology, 61: 412, 2003.

386. Kao TC., Garner D., Foley J., Seay T., Friedrichs P., Thrasher JB., et al : Multicenter patient self-reporting questionnaire on impotence, incontinence and stricture after radical prostatectomy. J. Urol., 163: 858, 2000.

387. Moul JW, Mooneyhan RM, Kao TC, McLeod DG, and Cruess DF.: Preoperative and operative factors to predict incontinence, impotence and stricture after radical prostatectomy. Prostate Cancer Prostatic Dis., 1: 242, 1998.

388. Lee SE, Byun SS, Lee HJ, Song SH, Chang IH, Kim YJ, Gill MC, and Hong SK. Impact of variations in prostatic apex shape on early recovery on urinary continence after radical retropubic prostatectomy. Urology 68 : 137-41, 2006.

389. Johnson TK, Gilliland FD, Hoffman RM, Deapen D, Penson DF, Stanforn J>, e tal. Racial/ethnic differences in functional outcomes in the 5 years after diagnosis of localized prostate concer. J Clin Onco 22(20) : 4193-4201, Oct 2004.

390. Formenti SC, Lieskovsky G, Skinner D, Tsao-Wei DD, Groshen S, and Petrovich Z.: Update on impact of moderate dose of adjuvant radiation on urinary continence and sexual potency in prostate cancer patients treated with nerve-sparing prostatectomy. Urology, 56: 453, 2000.

391. Hofmann T, Gaensheimer S, Buchner A, Rohloff R, and Schilling A. An unrandomized prospective comparison of urinary continence, bowel symptoms and the need for further procedures in patients with and with no adjuvant radiation after radical prostatectomy. BJU Int 92 : 360-4, 2003.

392. Barker JC, Mitteness LS. Nocturia in the elderly. Gerontologist 1988; Feb;28(1):99-104.

393. Cartwright R, Renganathan A, Cardozo L. Current management of overactive bladder. Curr Opin Obstet Gynecol 2008; Oct;20(5):489-95.

394. Tikkinen KAO. Epidemiology of Nocturia - Results from the FINNO Study [dissertation]. Tampere, Finland: Tampere University Press; 2010. Available at: http://acta.uta.fi/pdf/978-951-44-8020-1.pdf

395. Weiss JP, Blaivas JG. Nocturia. J Urol 2000; Jan;163(1):5-12.

396. Tikkinen KA, Auvinen A. Does the Imprecise Definition of Overactive Bladder Serve Commercial Rather than Patient Interests? Eur Urol. 2012 Apr;61(4):746-8; discussion 749-50. Epub 2012 Jan 5.

397. Irwin DE, Milsom I, Kopp Z, Abrams P, EPIC Study Group. Symptom bother and health care-seeking behavior among individuals with overactive bladder. Eur Urol 2008; May;53(5):1029-37.

398. Coyne KS, Sexton CC, Thompson CL, Milsom I, Irwin D, Kopp ZS, et al. The prevalence of lower urinary tract symptoms (LUTS) in the USA, the UK and Sweden: results from the Epidemiology of LUTS (EpiLUTS) study. BJU Int 2009; Aug;104(3):352-60.

399. Vaughan CP, Johnson TM,2nd, Ala-Lipasti MA, Cartwright R, Tammela TL, Taari K, et al. The Prevalence of Clinically Meaningful Overactive Bladder: Bother and Quality of Life Results from the Population-Based FINNO Study. Eur Urol 2011; Jan 25;.

400. McGrother CW, Donaldson MM, Hayward T, Matthews R, Dallosso HM, Hyde C, et al. Urinary storage symptoms and comorbidities: a prospective population cohort study in middle-aged and older women. Age Ageing 2006; Jan;35(1):16-24.

401. Coyne KS, Sexton CC, Irwin DE, Kopp ZS, Kelleher CJ, Milsom I. The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: results from the EPIC study. BJU Int 2008; Jun;101(11):1388-95.

402. Middelkoop HA, Smilde-van den Doel DA, Neven AK, Kamphuisen HA, Springer CP. Subjective sleep characteristics of 1,485 males and females aged 50-93: effects of sex and age, and factors related to self-evaluated quality of sleep. J Gerontol A Biol Sci Med Sci 1996; May;51(3):M108-15.

403. Bing MH, Moller LA, Jennum P, Mortensen S, Skovgaard LT, Lose G. Prevalence and bother of nocturia, and causes of sleep interruption in a Danish population of men and women aged 60-80 years. BJU Int 2006; Sep;98(3):599-604.

404. Bliwise DL, Foley DJ, Vitiello MV, Ansari FP, Ancoli-Israel S, Walsh JK. Nocturia and disturbed sleep in the elderly. Sleep Med 2009; May;10(5):540-8.

405. Schatzl G, Temml C, Schmidbauer J, Dolezal B, Haidinger G, Madersbacher S. Cross-sectional study of nocturia in both sexes: analysis of a voluntary health screening project. Urology 2000; Jul;56(1):71-5.

406. Coyne KS, Zhou Z, Bhattacharyya SK, Thompson CL, Dhawan R, Versi E. The prevalence of nocturia and its effect on health-related quality of life and sleep in a community sample in the USA. BJU Int 2003; Dec;92(9):948-54.

407. Fiske J, Scarpero HM, Xue X, Nitti VW. Degree of bother caused by nocturia in women. Neurourol Urodyn 2004;23(2):130-3.

408. Liew LC, Tiong HY, Wong ML, Png DC, Tan JK. A population study of nocturia in Singapore. BJU Int 2006; Jan;97(1):109-12.

409. Yu HJ, Chen FY, Huang PC, Chen TH, Chie WC, Liu CY. Impact of nocturia on symptom-specific quality of life among community-dwelling adults aged 40 years and older. Urology 2006; Apr;67(4):713-8.

410. Lowenstein L, Brubaker L, Kenton K, Kramer H, Shott S, FitzGerald MP. Prevalence and impact of nocturia in a urogynecologic population. Int Urogynecol J Pelvic Floor Dysfunct 2007; Sep;18(9):1049-52.

411. Choo MS, Ku JH, Park CH, Lee YS, Lee KS, Lee JG, et al. Prevalence of nocturia in a Korean population aged 40 to 89 years. Neurourol Urodyn 2008;27(1):60-4.

412. Tikkinen KA, Johnson TM,2nd, Tammela TL, Sintonen H, Haukka J, Huhtala H, et al. Nocturia frequency, bother, and quality of life: how often is too often? A population-based study in Finland. Eur Urol 2010; Mar;57(3):488-96.

413. Asplund R, Marnetoft SU, Selander J, Akerstrom B. Nocturia in relation to somatic health, mental health and pain in adult men and women. BJU Int 2005; Apr;95(6):816-9.

414. Kupelian V, Wei JT, O'Leary MP, Norgaard JP, Rosen RC, McKinlay JB. Nocturia and quality of life: results from the Boston area community health survey. Eur Urol 2012; Jan;61(1):78-84.

415. Stewart RB, Moore MT, May FE, Marks RG, Hale WE. Nocturia: a risk factor for falls in the elderly. J Am Geriatr Soc 1992; Dec;40(12):1217-20.

416. Brown JS, Vittinghoff E, Wyman JF, Stone KL, Nevitt MC, Ensrud KE, et al. Urinary incontinence: does it increase risk for falls and fractures? Study of Osteoporotic Fractures Research Group. J Am Geriatr Soc 2000; Jul;48(7):721-5.

417. Temml C, Ponholzer A, Gutjahr G, Berger I, Marszalek M, Madersbacher S. Nocturia is an age-independent risk factor for hip-fractures in men. Neurourol Urodyn 2009;28(8):949-52.

418. Asplund R. Hip fractures, nocturia, and nocturnal polyuria in the elderly. Arch Gerontol Geriatr 2006; Nov-Dec;43(3):319-26.

419. Parsons JK, Mougey J, Lambert L, Wilt TJ, Fink HA, Garzotto M, et al. Lower urinary tract symptoms increase the risk of falls in older men. BJU Int 2009; Jul;104(1):63-8.

420. Vaughan CP, Brown CJ, Goode PS, Burgio KL, Allman RM, Johnson TM,2nd. The association of nocturia with incident falls in an elderly community-dwelling cohort. Int J Clin Pract 2010; Apr;64(5):577-83.

421. Nakagawa H, Niu K, Hozawa A, Ikeda Y, Kaiho Y, Ohmori-Matsuda K, et al. Impact of nocturia on bone fracture and mortality in older individuals: a Japanese longitudinal cohort study. J Urol 2010; Oct;184(4):1413-8.

422. Moon SJ, Kim YT, Lee TY, Moon H, Kim MJ, Kim SA, et al. The influence of an overactive bladder on falling: a study of females aged 40 and older in the community. Int Neurourol J 2011; Mar;15(1):41-7.

423. Asplund R. Mortality in the elderly in relation to nocturnal micturition. BJU Int 1999; Aug;84(3):297-301.

424. Bursztyn M, Jacob J, Stessman J. Usefulness of nocturia as a mortality risk factor for coronary heart disease among persons born in 1920 or 1921. Am J Cardiol 2006; Nov 15;98(10):1311-5.

425. Kupelian V, Fitzgerald MP, Kaplan SA, Norgaard JP, Chiu GR, Rosen RC. Association of Nocturia and Mortality: Results From the Third National Health and Nutrition Examination Survey. J Urol 2010; Dec 17;.

426. Hunskaar S. Epidemiology of nocturia. BJU Int 2005; Sep;96 Suppl 1:4-7.

427. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Subcommittee of the International Continence Society. Neurourol Urodyn 2002;21(2):167-78.

428. Abrams P, Artibani W, Cardozo L, Dmochowski R, van Kerrebroeck P, Sand P, et al. Reviewing the ICS 2002 terminology report: the ongoing debate. Neurourol Urodyn 2009;28(4):287.

429. Weiss JP, Wein AJ, van Kerrebroeck P, Dmochowski R, Fitzgerald MP, Tikkinen KAO, et al. Nocturia: New Directions ICI-RS Think Tank 2010 2010;(in press).

430. Wein A. Symptom-based diagnosis of overactive bladder: an overview. Can Urol Assoc J 2011; Oct;5(5 Suppl 2):S135-6.

431. Abrams P, Wein A. Re: Kari A.O. Tikkinen, Anssi Auvinen. Does the Imprecise Definition of Overactive Bladder Serve Commercial Rather than Patient Interests? Eur Urol 2012 (in press).

432. Roberts W. Observations on some of the daily changes of the urine 1860;5:817-825,906-923.

433. Rubin SW, Nagel H. Nocturia in the aged. J Am Med Assoc 1951; Oct 27;147(9):840-1.

434. van Kerrebroeck P, Abrams P, Chaikin D, Donovan J, Fonda D, Jackson S, et al. The standardisation of terminology in nocturia: report from the Standardisation Sub-committee of the International Continence Society. Neurourol Urodyn 2002;21(2):179-83.

435. Madersbacher H. Overactive bladder: a clinical entity or a marketing hype?. Eur Urol 2005; Mar;47(3):273-6.

436. Blaivas JG. Overactive bladder and the definition of urgency. Neurourol Urodyn 2007;26(6):757,8; discussion 759-60.

437. Yamaguchi O, Honda K, Nomiya M, Shishido K, Kakizaki H, Tanaka H, et al. Defining overactive bladder as hypersensitivity. Neurourol Urodyn 2007; Oct;26(6 Suppl):904-7.

438. Homma Y. Lower urinary tract symptomatology: Its definition and confusion. Int J Urol 2008; Jan;15(1):35-43.

439. Dmochowski RR, FitzGerald MP, Wyndaele JJ. Measuring urgency in clinical practice. World J Urol 2009; Dec;27(6):739-45.

440. De Wachter S, Hanno P. Urgency: all or none phenomenon?. Neurourol Urodyn 2010; Apr;29(4):616-7.

441. Shah JR. Should we treat lower urinary tract symptoms without a definitive diagnosis? No. BMJ 2011; Dec 1;343:d6058.

442. Abrams P. Should we treat lower urinary tract symptoms without a definitive diagnosis? Yes. BMJ 2011; Dec 1;343:d6038.

443. Zinner NR. OAB. Are we barking up the wrong tree? A lesson from my dog. Neurourol Urodyn 2011; Nov;30(8):1410-1.

444. Abrams P. Response to OAB, are we barking up the wrong tree? A lesson from my dog. Neurourol Urodyn 2011; Nov;30(8):1409; discussion 1412-4.

445. Herschorn S. Overactive bladder: Symptom complex or separate entity?. Can Urol Assoc J 2011; Oct;5(5 Suppl 2):S152-4.

446. Parazzini F, Lavezzari M, Arbitani W. Prevalence of overactive bladder and urinary incontinence. J Fam Pract 2002; Dec;51(12):1072-5.

447. Lapitan MC, Chye PL, Asia-Pacific Continence Advisory Board. The epidemiology of overactive bladder among females in Asia: a questionnaire survey. Int Urogynecol J Pelvic Floor Dysfunct 2001;12(4):226-31.

448. Milsom I, Abrams P, Cardozo L, Roberts RG, Thuroff J, Wein AJ. How widespread are the symptoms of an overactive bladder and how are they managed? A population-based prevalence study. BJU Int 2001; Jun;87(9):760-6.

449. Chen GD, Lin TL, Hu SW, Chen YC, Lin LY. Prevalence and correlation of urinary incontinence and overactive bladder in Taiwanese women. Neurourol Urodyn 2003;22(2):109-17.

450. Stewart WF, Van Rooyen JB, Cundiff GW, Abrams P, Herzog AR, Corey R, et al. Prevalence and burden of overactive bladder in the United States. World J Urol 2003; May;20(6):327-36.

451. Temml C, Heidler S, Ponholzer A, Madersbacher S. Prevalence of the overactive bladder syndrome by applying the International Continence Society definition. Eur Urol 2005; Oct;48(4):622-7.

452. Homma Y, Yamaguchi O, Hayashi K, Neurogenic Bladder Society Committee. An epidemiological survey of overactive bladder symptoms in Japan. BJU Int 2005; Dec;96(9):1314-8.

453. Safarinejad MR. Prevalence of the overactive bladder among Iranian women based on the International Continence Society definition: a population-based study. Int Urol Nephrol 2009;41(1):35-45.

454. Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. BJU Int 2011; Oct;108(7):1132-8.

455. Irwin DE, Milsom I, Hunskaar S, Reilly K, Kopp Z, Herschorn S, et al. Population-Based Survey of Urinary Incontinence, Overactive Bladder, and Other Lower Urinary Tract Symptoms in Five Countries: Results of the EPIC Study. Eur Urol 2006; Dec;50(6):1306-15.

456. Corcos J, Schick E. Prevalence of overactive bladder and incontinence in Canada. Can J Urol 2004; Jun;11(3):2278-84.

457. Teloken C, Caraver F, Weber FA, Teloken PE, Moraes JF, Sogari PR, et al. Overactive bladder: prevalence and implications in Brazil. Eur Urol 2006; Jun;49(6):1087-92.

458. Yu HJ, Liu CY, Lee KL, Lee WC, Chen TH. Overactive bladder syndrome among community-dwelling adults in Taiwan: prevalence, correlates, perception, and treatment seeking. Urol Int 2006;77(4):327-33.

459. Tikkinen KA, Tammela TL, Rissanen AM, Valpas A, Huhtala H, Auvinen A. Is the prevalence of overactive bladder overestimated? A population-based study in Finland. PLoS ONE 2007; Feb 7;2:e195.

460. Choo MS, Ku JH, Lee JB, Lee DH, Kim JC, Kim HJ, et al. Cross-cultural differences for adapting overactive bladder symptoms: results of an epidemiologic survey in Korea. World J Urol 2007; Oct;25(5):505-11.

461. Herschorn S, Gajewski J, Schulz J, Corcos J. A population-based study of urinary symptoms and incontinence: the Canadian Urinary Bladder Survey. BJU Int 2008; Jan;101(1):52-8.

462. Benner JS, Becker R, Fanning K, Jumadilova Z, Bavendam T, Brubaker L, et al. Bother related to bladder control and health care seeking behavior in adults in the United States. J Urol 2009; Jun;181(6):2591-8.

463. Correia S, Dinis P, Rolo F, Lunet N. Prevalence, treatment and known risk factors of urinary incontinence and overactive bladder in the non-institutionalized Portuguese population. Int Urogynecol J Pelvic Floor Dysfunct 2009; Aug 14;.

464. Lee YS, Lee KS, Jung JH, Han DH, Oh SJ, Seo JT, et al. Prevalence of overactive bladder, urinary incontinence, and lower urinary tract symptoms: results of Korean EPIC study. World J Urol 2011; Apr;29(2):185-90.

465. Wang Y, Xu K, Hu H, Zhang X, Wang X, Na Y, et al. Prevalence, risk factors, and impact on health related quality of life of overactive bladder in China. Neurourol Urodyn 2011; Nov;30(8):1448-55.

466. Irwin DE, Milsom I, Chancellor MB, Kopp Z, Guan Z. Dynamic progression of overactive bladder and urinary incontinence symptoms: a systematic review. Eur Urol 2010; Oct;58(4):532-43.

467. Dallosso HM, McGrother CW, Matthews RJ, Donaldson MM, Leicestershire MRC Incontinence Study Group. Nutrient composition of the diet and the development of overactive bladder: a longitudinal study in women. Neurourol Urodyn 2004;23(3):204-10.

468. Dallosso HM, Matthews RJ, McGrother CW, Donaldson MM, Shaw C, Leicestershire MRC Incontinence Study Group. The association of diet and other lifestyle factors with the onset of overactive bladder: a longitudinal study in men. Public Health Nutr 2004; Oct;7(7):885-91.

469. Wennberg AL, Molander U, Fall M, Edlund C, Peeker R, Milsom I. A longitudinal population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in women. Eur Urol 2009; Apr;55(4):783-91.

470. Malmsten UG, Molander U, Peeker R, Irwin DE, Milsom I. Urinary incontinence, overactive bladder, and other lower urinary tract symptoms: a longitudinal population-based survey in men aged 45-103 years. Eur Urol 2010; Jul;58(1):149-56.

471. Heidler S, Mert C, Temml C, Madersbacher S. The natural history of the overactive bladder syndrome in females: a long-term analysis of a health screening project. Neurourol Urodyn 2011; Nov;30(8):1437-41.

472. Lawrence JM, Lukacz ES, Nager CW, Hsu JW, Luber KM. Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. Obstet Gynecol 2008; Mar;111(3):678-85.

473. Coyne KS, Margolis MK, Kopp ZS, Kaplan SA. Racial Differences in the Prevalence of Overactive Bladder in the United States From the Epidemiology of LUTS (EpiLUTS) Study. Urology 2012; Jan;79(1):95-101.

474. Fitzgerald MP, Thom DH, Wassel-Fyr C, Subak L, Brubaker L, Van Den Eeden SK, et al. Childhood urinary symptoms predict adult overactive bladder symptoms. J Urol 2006; Mar;175(3 Pt 1):989-93.

475. Labrie J, de Jong TP, Nieuwhof-Leppink A, van der Deure J, Vijverberg MA, van der Vaart CH. The relationship between children with voiding problems and their parents. J Urol 2010; May;183(5):1887-91.

476. Lawrence JM, Lukacz ES, Liu IL, Nager CW, Luber KM. Pelvic floor disorders, diabetes, and obesity in women: findings from the Kaiser Permanente Continence Associated Risk Epidemiology Study. Diabetes Care 2007; Oct;30(10):2536-41.

477. Teleman PM, Lidfeldt J, Nerbrand C, Samsioe G, Mattiasson A, WHILA study group. Overactive bladder: prevalence, risk factors and relation to stress incontinence in middle-aged women. BJOG 2004; Jun;111(6):600-4.

478. Ikeda Y, Nakagawa H, Ohmori-Matsuda K, Hozawa A, Masamune Y, Nishino Y, et al. Risk factors for overactive bladder in the elderly population: a community-based study with face-to-face interview. Int J Urol 2011; Mar;18(3):212-8.

479. Whitcomb EL, Lukacz ES, Lawrence JM, Nager CW, Luber KM. Prevalence and degree of bother from pelvic floor disorders in obese women. Int Urogynecol J Pelvic Floor Dysfunct 2009; Mar;20(3):289-94.

480. Liu RT, Chung MS, Lee WC, Chang SW, Huang ST, Yang KD, et al. Prevalence of overactive bladder and associated risk factors in 1359 patients with type 2 diabetes. Urology 2011; Nov;78(5):1040-5.

481. Bradley CS, Kennedy CM, Nygaard IE. Pelvic floor symptoms and lifestyle factors in older women. J Womens Health (Larchmt) 2005; Mar;14(2):128-36.

482. Shaper AG, Wannamethee G, Walker M. Alcohol and mortality in British men: explaining the U-shaped curve. Lancet 1988; Dec 3;2(8623):1267-73.

483. Fillmore KM, Stockwell T, Chikritzhs T, Bostrom A, Kerr W. Moderate alcohol use and reduced mortality risk: systematic error in prospective studies and new hypotheses. Ann Epidemiol 2007; May;17(5 Suppl):S16-23.

484. Naimi TS, Brown DW, Brewer RD, Giles WH, Mensah G, Serdula MK, et al. Cardiovascular risk factors and confounders among nondrinking and moderate-drinking U.S. adults. Am J Prev Med 2005; May;28(4):369-73.

485. Jackson R, Broad J, Connor J, Wells S. Alcohol and ischaemic heart disease: probably no free lunch. Lancet 2005; Dec 3;366(9501):1911-2.

486. Tettamanti G, Altman D, Pedersen NL, Bellocco R, Milsom I, Iliadou AN. Effects of coffee and tea consumption on urinary incontinence in female twins. BJOG 2011; Jun;118(7):806-13.

487. Tahtinen RM, Auvinen A, Cartwright R, Johnson TM, Tammela TL, Tikkinen KA. Smoking and bladder symptoms in women. Obstet Gynecol 2011; Sep;118(3):643-8.

488. Nuotio M, Jylha M, Koivisto AM, Tammela TL. Association of smoking with urgency in older people. Eur Urol 2001; Aug;40(2):206-12.

489. de Boer TA, Slieker-ten Hove MC, Burger CW, Vierhout ME. The prevalence and risk factors of overactive bladder symptoms and its relation to pelvic organ prolapse symptoms in a general female population. Int Urogynecol J 2011; May;22(5):569-75.

490. Handa VL, Blomquist JL, Knoepp LR, Hoskey KA, McDermott KC, Munoz A. Pelvic floor disorders 5-10 years after vaginal or cesarean childbirth. Obstet Gynecol 2011; Oct;118(4):777-84.

491. Chuang FC, Kuo HC. Prevalence of lower urinary tract symptoms in indigenous and non-indigenous women in Eastern Taiwan. J Formos Med Assoc 2010; Mar;109(3):228-36.

492. Finkelstein K, Glosner S, Sanchez RJ, Uddin N. Prevalence of probable overactive bladder in a private obstetrics and gynecology group practice. Curr Med Res Opin 2008; Apr;24(4):1083-90.

493. Cheung WW, Blank W, Borawski D, Tran W, Bluth MH. Prevalence of overactive bladder, its under-diagnosis, and risk factors in a male urologic veterans population. Int J Med Sci 2010; Nov 12;7(6):391-4.

494. Viktrup L. The risk of lower urinary tract symptoms five years after the first delivery. Neurourol Urodyn 2002;21(1):2-29.

495. Liang CC, Chang SD, Lin SJ, Lin YJ. Lower urinary tract symptoms in primiparous women before and during pregnancy. Arch Gynecol Obstet 2011; Nov 1;.

496. Aslan D, Aslan G, Yamazhan M, Ispahi C, Tinar S. Voiding symptoms in pregnancy: an assessment with international prostate symptom score. Gynecol Obstet Invest 2003;55(1):46-9.

497. Sun MJ, Chen GD, Chang SY, Lin KC, Chen SY. Prevalence of lower urinary tract symptoms during pregnancy in Taiwan. J Formos Med Assoc 2005; Mar;104(3):185-9.

498. Adaji S, Shittu O, Bature S, Nasir S, Olatunji O. Bothersome lower urinary symptoms during pregnancy: a preliminary study using the International Consultation on Incontinence Questionnaire. Afr Health Sci 2011; Aug;11 Suppl 1:S46-52.

499. Parazzini F, Chiaffarino F, Lavezzari M, Giambanco V, VIVA Study Group. Risk factors for stress, urge or mixed urinary incontinence in Italy. BJOG 2003; Oct;110(10):927-33.

500. Tikkinen KA, Auvinen A, Tiitinen A, Valpas A, Johnson TM,2nd, Tammela TL. Reproductive factors associated with nocturia and urinary urgency in women – a population-based study in Finland 2008;(in press).

501. Alling Moller L, Lose G, Jorgensen T. Risk factors for lower urinary tract symptoms in women 40 to 60 years of age. Obstet Gynecol 2000; Sep;96(3):446-51.

502. Handa VL, Harvey L, Fox HE, Kjerulff KH. Parity and route of delivery: does cesarean delivery reduce bladder symptoms later in life?. Am J Obstet Gynecol 2004; Aug;191(2):463-9.

503. Zhang W, Song Y, He X, Huang H, Xu B, Song J. Prevalence and risk factors of overactive bladder syndrome in Fuzhou Chinese women. Neurourol Urodyn 2006;25(7):717-21.

504. Scarpa KP, Herrmann V, Palma PC, Ricetto CL, Morais S. Prevalence of urinary symptoms in the third trimester of pregnancy. Rev Assoc Med Bras 2006; May-Jun;52(3):153-6.

505. van Brummen HJ, Bruinse HW, van de Pol G, Heintz AP, van der Vaart CH. The effect of vaginal and cesarean delivery on lower urinary tract symptoms: what makes the difference?. Int Urogynecol J Pelvic Floor Dysfunct 2007; Feb;18(2):133-9.

506. Ekstrom A, Altman D, Wiklund I, Larsson C, Andolf E. Planned cesarean section versus planned vaginal delivery: comparison of lower urinary tract symptoms. Int Urogynecol J Pelvic Floor Dysfunct 2008; Apr;19(4):459-65.

507. Lukacz ES, Lawrence JM, Contreras R, Nager CW, Luber KM. Parity, mode of delivery, and pelvic floor disorders. Obstet Gynecol 2006; Jun;107(6):1253-60.

508. Rekers H, Drogendijk AC, Valkenburg HA, Riphagen F. The menopause, urinary incontinence and other symptoms of the genito-urinary tract. Maturitas 1992; Oct;15(2):101-11.

509. Prasad M, Sadhukhan M, Tom B, Al-Taher H. The effect of hysterectomy on urinary symptoms and residual bladder volume. J Obstet Gynaecol 2002; Sep;22(5):544-7.

510. Cody JD, Richardson K, Moehrer B, Hextall A, Glazener CM. Oestrogen therapy for urinary incontinence in postmenopausal women. Cochrane Database Syst Rev 2009; Oct 7;(4)(4):CD001405.

511. Iliadou A, Milsom I, Pedersen NL, Altman D. Risk of urinary incontinence symptoms in oral contraceptive users: a national cohort study from the Swedish Twin Register. Fertil Steril 2009; Aug;92(2):428-33.

512. Plotti F, Angioli R, Zullo MA, Sansone M, Altavilla T, Antonelli E, et al. Update on urodynamic bladder dysfunctions after radical hysterectomy for cervical cancer. Crit Rev Oncol Hematol 2011; Nov;80(2):323-9.

513. Hazewinkel MH, Sprangers MA, van der Velden J, van der Vaart CH, Stalpers LJ, Burger MP, et al. Long-term cervical cancer survivors suffer from pelvic floor symptoms: a cross-sectional matched cohort study. Gynecol Oncol 2010; May;117(2):281-6.

514. Stanton SL, Hilton P, Norton C, Cardozo L. Clinical and urodynamic effects of anterior colporrhaphy and vaginal hysterectomy for prolapse with and without incontinence. Br J Obstet Gynaecol 1982; Jun;89(6):459-63.

515. Virtanen H, Makinen J, Tenho T, Kiilholma P, Pitkanen Y, Hirvonen T. Effects of abdominal hysterectomy on urinary and sexual symptoms. Br J Urol 1993; Dec;72(6):868-72.

516. Altman D, Lopez A, Falconer C, Zetterstrom J. The impact of hysterectomy on lower urinary tract symptoms. Int Urogynecol J Pelvic Floor Dysfunct 2003; Dec;14(6):418-23.

517. Weber AM, Walters MD, Schover LR, Church JM, Piedmonte MR. Functional outcomes and satisfaction after abdominal hysterectomy. Am J Obstet Gynecol 1999; Sep;181(3):530-5.

518. de Tayrac R, Chevalier N, Chauveaud-Lambling A, Gervaise A, Fernandez H. Is vaginal hysterectomy a risk factor for urinary incontinence at long-term follow-up?. Eur J Obstet Gynecol Reprod Biol 2007; Feb;130(2):258-61.

519. Krogh RA, Neumann GA, Lauszus FF, Guttorm E, Rasmussen KL. Hysterectomy is associated with stress incontinence in women who previously had a transcervical endometrial resection. Gynecol Obstet Invest 2007;63(3):121-5.

520. Vervest HA, Kiewiet de Jonge M, Vervest TM, Barents JW, Haspels AA. Micturition symptoms and urinary incontinence after non-radical hysterectomy. Acta Obstet Gynecol Scand 1988;67(2):141-6.

521. Carlson KJ, Miller BA, Fowler FJ,Jr. The Maine Women's Health Study: I. Outcomes of hysterectomy. Obstet Gynecol 1994; Apr;83(4):556-65.

522. Thakar R, Ayers S, Clarkson P, Stanton S, Manyonda I. Outcomes after total versus subtotal abdominal hysterectomy. N Engl J Med 2002; Oct 24;347(17):1318-25.

523. Learman LA, Summitt RL,Jr, Varner RE, McNeeley SG, Goodman-Gruen D, Richter HE, et al. A randomized comparison of total or supracervical hysterectomy: surgical complications and clinical outcomes. Obstet Gynecol 2003; Sep;102(3):453-62.

524. Phelan S, Kanaya AM, Subak LL, Hogan PE, Espeland MA, Wing RR, et al. Prevalence and risk factors for urinary incontinence in overweight and obese diabetic women: action for health in diabetes (look ahead) study. Diabetes Care 2009; Aug;32(8):1391-7.

525. El-Toukhy TA, Hefni M, Davies A, Mahadevan S. The effect of different types of hysterectomy on urinary and sexual functions: a prospective study. J Obstet Gynaecol 2004; Jun;24(4):420-5.

526. Link CL, Pulliam SJ, McKinlay JB. Hysterectomies and Urologic Symptoms: Results from the Boston Area Community Health (BACH) Survey. Female Pelvic Med Reconstr Surg 2010; Jan;16(1):37-47.

527. Kershen RT, Appell RA. De novo urge syndrome and detrusor instability after anti-incontinence surgery: current concepts, evaluation, and treatment. Curr Urol Rep 2002; Oct;3(5):345-53.

528. Holmgren C, Nilsson S, Lanner L, Hellberg D. Frequency of de novo urgency in 463 women who had undergone the tension-free vaginal tape (TVT) procedure for genuine stress urinary incontinence--a long-term follow-up. Eur J Obstet Gynecol Reprod Biol 2007; May;132(1):121-5.

529. Van Venrooij GE, Van Melick HH, Eckhardt MD, Boon TA. Correlations of urodynamic changes with changes in symptoms and well-being after transurethral resection of the prostate. J Urol 2002; Aug;168(2):605-9.

530. Abrams PH, Farrar DJ, Turner-Warwick RT, Whiteside CG, Feneley RC. The results of prostatectomy: a symptomatic and urodynamic analysis of 152 patients. J Urol 1979; May;121(5):640-2.

531. de Nunzio C, Franco G, Rocchegiani A, Iori F, Leonardo C, Laurenti C. The evolution of detrusor overactivity after watchful waiting, medical therapy and surgery in patients with bladder outlet obstruction. J Urol 2003; Feb;169(2):535-9.

532. Housami F, Abrams P. Persistent detrusor overactivity after transurethral resection of the prostate. Curr Urol Rep 2008; Jul;9(4):284-90.

533. Miedel A, Tegerstedt G, Maehle-Schmidt M, Nyren O, Hammarstrom M. Symptoms and pelvic support defects in specific compartments. Obstet Gynecol 2008; Oct;112(4):851-8.

534. Tegerstedt G, Maehle-Schmidt M, Nyren O, Hammarstrom M. Prevalence of symptomatic pelvic organ prolapse in a Swedish population. Int Urogynecol J Pelvic Floor Dysfunct 2005; Nov-Dec;16(6):497-503.

535. Fritel X, Varnoux N, Zins M, Breart G, Ringa V. Symptomatic pelvic organ prolapse at midlife, quality of life, and risk factors. Obstet Gynecol 2009; Mar;113(3):609-16.

536. de Boer TA, Salvatore S, Cardozo L, Chapple C, Kelleher C, van Kerrebroeck P, et al. Pelvic organ prolapse and overactive bladder. Neurourol Urodyn 2010;29(1):30-9.

537. Link CL, Lutfey KE, Steers WD, McKinlay JB. Is abuse causally related to urologic symptoms? Results from the Boston Area Community Health (BACH) Survey. Eur Urol 2007; Aug;52(2):397-406.

538. Jundt K, Scheer I, Schiessl B, Pohl K, Haertl K, Peschers UM. Physical and sexual abuse in patients with overactive bladder: is there an association?. Int Urogynecol J Pelvic Floor Dysfunct 2007; Apr;18(4):449-53.

539. Coyne KS, Sexton CC, Kopp ZS, Ebel-Bitoun C, Milsom I, Chapple C. The impact of overactive bladder on mental health, work productivity and health-related quality of life in the UK and Sweden: results from EpiLUTS. BJU Int 2011; Nov;108(9):1459-71.

540. Hullfish KL, Fenner DE, Sorser SA, Visger J, Clayton A, Steers WD. Postpartum depression, urge urinary incontinence, and overactive bladder syndrome: is there an association?. Int Urogynecol J Pelvic Floor Dysfunct 2007; Oct;18(10):1121-6.

541. Kupelian V, Rosen RC, Link CL, McVary KT, Aiyer LP, Mollon P, et al. Association of urological symptoms and chronic illness in men and women: contributions of symptom severity and duration--results from the BACH Survey. J Urol 2009; Feb;181(2):694-700.

542. Fayyad AM, Hill SR, Jones G. Prevalence and risk factors for bothersome lower urinary tract symptoms in women with diabetes mellitus from hospital-based diabetes clinic. Int Urogynecol J Pelvic Floor Dysfunct 2009; Nov;20(11):1339-44.

543. Tibaek S, Gard G, Klarskov P, Iversen HK, Dehlendorff C, Jensen R. Prevalence of lower urinary tract symptoms (LUTS) in stroke patients: a cross-sectional, clinical survey. Neurourol Urodyn 2008;27(8):763-71.

544. Britton JP, Dowell AC, Whelan P. Prevalence of urinary symptoms in men aged over 60. Br J Urol 1990; Aug;66(2):175-6.

545. Garraway WM, Collins GN, Lee RJ. High prevalence of benign prostatic hypertrophy in the community. Lancet 1991; Aug 24;338(8765):469-71.

546. Chute CG, Panser LA, Girman CJ, Oesterling JE, Guess HA, Jacobsen SJ, et al. The prevalence of prostatism: a population-based survey of urinary symptoms. J Urol 1993; Jul;150(1):85-9.

547. Sagnier PP, MacFarlane G, Richard F, Botto H, Teillac P, Boyle P. Results of an epidemiological survey using a modified American Urological Association symptom index for benign prostatic hyperplasia in France. J Urol 1994; May;151(5):1266-70.

548. Homma Y, Imajo C, Takahashi S, Kawabe K, Aso Y. Urinary symptoms and urodynamics in a normal elderly population. Scand J Urol Nephrol Suppl 1994;157:27-30.

549. Malmsten UG, Milsom I, Molander U, Norlen LJ. Urinary incontinence and lower urinary tract symptoms: an epidemiological study of men aged 45 to 99 years. J Urol 1997; Nov;158(5):1733-7.

550. Sommer P, Nielsen KK, Bauer T, Kristensen ES, Hermann GG, Steven K, et al. Voiding patterns in men evaluated by a questionnaire survey. Br J Urol 1990; Feb;65(2):155-60.

551. Brieger GM, Yip SK, Hin LY, Chung TK. The prevalence of urinary dysfunction in Hong Kong Chinese women. Obstet Gynecol 1996; Dec;88(6):1041-4.

552. Samuelsson E, Victor A, Tibblin G. A population study of urinary incontinence and nocturia among women aged 20-59 years. Prevalence, well-being and wish for treatment. Acta Obstet Gynecol Scand 1997; Jan;76(1):74-80.

553. Pinnock C, Marshall VR. Troublesome lower urinary tract symptoms in the community: a prevalence study. Med J Aust 1997; Jul 21;167(2):72-5.

554. van Dijk L, Kooij DG, Schellevis FG. Nocturia in the Dutch adult population. BJU Int 2002; Nov;90(7):644-8.

555. Rembratt A, Norgaard JP, Andersson KE. Nocturia and associated morbidity in a community-dwelling elderly population. BJU Int 2003; Nov;92(7):726-30.

556. Yoshimura K, Terada N, Matsui Y, Terai A, Kinukawa N, Arai Y. Prevalence of and risk factors for nocturia: Analysis of a health screening program. Int J Urol 2004; May;11(5):282-7.

557. Tikkinen KA, Tammela TL, Huhtala H, Auvinen A. Is nocturia equally common among men and women? A population based study in Finland. J Urol 2006; Feb;175(2):596-600.

558. Zhang X, Zhang J, Chen J, Zhang C, Li Q, Xu T, et al. Prevalence and Risk Factors of Nocturia and Nocturia-Related Quality of Life in the Chinese Population. Urol Int 2011; Jan 5;.

559. Pinnock C, Marshall VR. Troublesome lower urinary tract symptoms in the community: a prevalence study. Med J Aust 1997; Jul 21;167(2):72-5.

560. Muscatello DJ, Rissel C, Szonyi G. Urinary symptoms and incontinence in an urban community: prevalence and associated factors in older men and women. Intern Med J 2001; Apr;31(3):151-60.

561. McGrother CW, Donaldson MM, Shaw C, Matthews RJ, Hayward TA, Dallosso HM, et al. Storage symptoms of the bladder: prevalence, incidence and need for services in the UK. BJU Int 2004; Apr;93(6):763-9.

562. Parsons M, Tissot W, Cardozo L, Diokno A, Amundsen CL, Coats AC, et al. Normative bladder diary measurements: night versus day. Neurourol Urodyn 2007;26(4):465-73.

563. Blanker MH, Bohnen AM, Groeneveld FP, Bernsen RM, Prins A, Ruud Bosch JL. Normal voiding patterns and determinants of increased diurnal and nocturnal voiding frequency in elderly men. J Urol 2000; Oct;164(4):1201-5.

564. Bosch JL, Weiss JP. The prevalence and causes of nocturia. J Urol 2010; Aug;184(2):440-6.

565. Tikkinen KAO, Johnson TM 2nd, Cartwright R. Epidemiology of Nocturia. In: Weiss JP, Blaivas J, van Kerrebroeck P, Wein AJ, eds. Nocturia: Causes, Consequences and Clinical Approaches, 1st edition. New York: Springer-Verlag, 2011.

566. Hunskaar S. Fluctuations in lower urinary tract symptoms in women. Reassurance and watchful waiting can prevent overtreatment. BMJ 2000; May 27;320(7247):1418-9.

567. Moller LA, Lose G, Jorgensen T. Incidence and remission rates of lower urinary tract symptoms at one year in women aged 40-60: longitudinal study. BMJ 2000; May 27;320(7247):1429-32.

568. Johnson TM,2nd, Sattin RW, Parmelee P, Fultz NH, Ouslander JG. Evaluating potentially modifiable risk factors for prevalent and incident nocturia in older adults. J Am Geriatr Soc 2005; Jun;53(6):1011-6.

569. van Doorn B, Blanker MH, Kok ET, Westers P, Bosch JL. Once nocturia, always nocturia? Natural history of nocturia in older men based on frequency-volume charts: the Krimpen study. J Urol 2011; Nov;186(5):1956-61.

570. Yoshimura K, Kamoto T, Tsukamoto T, Oshiro K, Kinukawa N, Ogawa O. Seasonal alterations in nocturia and other storage symptoms in three Japanese communities. Urology 2007; May;69(5):864-70.

571. Herzog AR, Fultz NH. Prevalence and incidence of urinary incontinence in community-dwelling populations. J Am Geriatr Soc 1990; Mar;38(3):273-81.

572. Hakkinen JT, Hakama M, Shiri R, Auvinen A, Tammela TL, Koskimaki J. Incidence of nocturia in 50 to 80-year-old Finnish men. J Urol 2006; Dec;176(6 Pt 1):2541,5; discussion 2545.

573. Asplund R, Aberg HE. Nocturia in relation to body mass index, smoking and some other life-style factors in women. Climacteric 2004; Sep;7(3):267-73.

574. Fitzgerald MP, Litman HJ, Link CL, McKinlay JB, BACH Survey Investigators. The association of nocturia with cardiac disease, diabetes, body mass index, age and diuretic use: results from the BACH survey. J Urol 2007; Apr;177(4):1385-9.

575. Laven BA, Orsini N, Andersson SO, Johansson JE, Gerber GS, Wolk A. Birth weight, abdominal obesity and the risk of lower urinary tract symptoms in a population based study of Swedish men. J Urol 2008; May;179(5):1891,5; discussion 1895-6.

576. Bing MH, Moller LA, Jennum P, Mortensen S, Lose G. Nocturia and associated morbidity in a Danish population of men and women aged 60-80 years. BJU Int 2008 Sep;102(7):808-14; discussion 814-5.

577. Burgio KL, Johnson TM,2nd, Goode PS, Markland AD, Richter HE, Roth DL, et al. Prevalence and correlates of nocturia in community-dwelling older adults. J Am Geriatr Soc 2010; May;58(5):861-6.

578. Shiri R, Hakama M, Hakkinen J, Auvinen A, Huhtala H, Tammela TL, et al. The effects of lifestyle factors on the incidence of nocturia. J Urol 2008; Nov;180(5):2059-62.

579. Hsieh CH, Chen HY, Hsu CS, Chang ST, Chiang CD. Risk factors for nocturia in Taiwanese women aged 20-59 years. Taiwan J Obstet Gynecol 2007; Jun;46(2):166-70.

580. Tikkinen KA, Auvinen A, Johnson TM,2nd, Weiss JP, Keranen T, Tiitinen A, et al. A systematic evaluation of factors associated with nocturia--the population-based FINNO study. Am J Epidemiol 2009; Aug 1;170(3):361-8.

581. Klein BE, Klein R, Lee KE, Bruskewitz RC. Correlates of urinary symptom scores in men. Am J Public Health 1999; Nov;89(11):1745-8.

582. Kang D, Andriole GL, Van De Vooren RC, Crawford D, Chia D, Urban DA, et al. Risk behaviours and benign prostatic hyperplasia. BJU Int 2004; Jun;93(9):1241-5.

583. Gourova LW, van de Beek C, Spigt MG, Nieman FH, van Kerrebroeck PE. Predictive factors for nocturia in elderly men: a cross-sectional study in 21 general practices. BJU Int 2006; Mar;97(3):528-32.

584. Blanker MH, Bernsen RM, Ruud Bosch JL, Thomas S, Groeneveld FP, Prins A, et al. Normal values and determinants of circadian urine production in older men: a population based study. J Urol 2002; Oct;168(4 Pt 1):1453-7.

585. Platz EA, Kawachi I, Rimm EB, Colditz GA, Stampfer MJ, Willett WC, et al. Physical activity and benign prostatic hyperplasia. Arch Intern Med 1998; Nov 23;158(21):2349-56.

586. Prezioso D, Catuogno C, Galassi P, D'Andrea G, Castello G, Pirritano D. Life-style in patients with LUTS suggestive of BPH. Eur Urol 2001;40 Suppl 1:9-12.

587. Rohrmann S, Crespo CJ, Weber JR, Smit E, Giovannucci E, Platz EA. Association of cigarette smoking, alcohol consumption and physical activity with lower urinary tract symptoms in older American men: findings from the third National Health And Nutrition Examination Survey. BJU Int 2005; Jul;96(1):77-82.

588. Soda T, Masui K, Okuno H, Terai A, Ogawa O, Yoshimura K. Efficacy of nondrug lifestyle measures for the treatment of nocturia. J Urol 2010; Sep;184(3):1000-4.

589. Gopal M, Sammel MD, Pien G, Gracia C, Freeman EW, Lin H, et al. Investigating the associations between nocturia and sleep disorders in perimenopausal women. J Urol 2008; Nov;180(5):2063-7.

590. Kupelian V, Link CL, Hall SA, McKinlay JB. Are Racial/Ethnic Disparities in the Prevalence of Nocturia Due to Socioeconomic Status? Results of the BACH Survey. J Urol 2009; Feb 20;.

591. Markland AD, Vaughan CP, Johnson TM,2nd, Goode PS, Redden DT, Burgio KL. Prevalence of Nocturia in United States Men: Results from the National Health and Nutrition Examination Survey. J Urol 2011; Jan 18;.

592. Munro-Faure AD, Beilin LJ, Bulpitt CJ, Coles EC, Dollery CT, Gear JS, et al. Comparison of black and white patients attending hypertension clinics in England. Br Med J 1979; Apr 21;1(6170):1044-7.

593. Sze EH, Jones WP, Ferguson JL, Barker CD, Dolezal JM. Prevalence of urinary incontinence symptoms among black, white, and Hispanic women. Obstet Gynecol 2002; Apr;99(4):572-5.

594. Lukacz ES, Whitcomb EL, Lawrence JM, Nager CW, Luber KM. Urinary frequency in community-dwelling women: what is normal?. Am J Obstet Gynecol 2009; May;200(5):552.e1,552.e7.

595. Kuo HC. Prevalence of lower urinary tract symptoms in male aborigines and non-aborigines in eastern Taiwan. J Formos Med Assoc 2008; Sep;107(9):728-35.

596. Mariappan P, Turner KJ, Sothilingam S, Rajan P, Sundram M, Stewart LH. Nocturia, nocturia indices and variables from frequency-volume charts are significantly different in Asian and Caucasian men with lower urinary tract symptoms: a prospective comparison study. BJU Int 2007; Aug;100(2):332-6.

597. Parboosingh J, Doig A. Studies of nocturia in normal pregnancy. J Obstet Gynaecol Br Commonw 1973; Oct;80(10):888-95.

598. Sharma JB, Aggarwal S, Singhal S, Kumar S, Roy KK. Prevalence of urinary incontinence and other urological problems during pregnancy: a questionnaire based study. Arch Gynecol Obstet 2009; Jun;279(6):845-51.

599. Asplund R, Aberg HE. Development of nocturia in relation to health, age and the menopause. Maturitas 2005; Aug 16;51(4):358-62.

600. Lose G, Alling-Moller L, Jennum P. Nocturia in women. Am J Obstet Gynecol 2001; Aug;185(2):514-21.

601. Lin TL, Ng SC, Chen YC, Hu SW, Chen GD. What affects the occurrence of nocturia more: menopause or age?. Maturitas 2005; Feb 14;50(2):71-7.

602. Cardozo L, Rekers H, Tapp A, Barnick C, Shepherd A, Schussler B, et al. Oestriol in the treatment of postmenopausal urgency: a multicentre study. Maturitas 1993; Dec;18(1):47-53.

603. Liapis A, Bakas P, Georgantopoulou C, Creatsas G. The use of oestradiol therapy in postmenopausal women after TVT-O anti-incontinence surgery. Maturitas 2010; May;66(1):101-6.

604. Yu HJ, Chen TH, Chie WC, Liu CY, Tung TH, Huang SW. Prevalence and associated factors of nocturia among adult residents of the Matsu area of Taiwan. J Formos Med Assoc 2005; Jun;104(6):444-7.

605. Homma Y, Yamaguchi T, Kondo Y, Horie S, Takahashi S, Kitamura T. Significance of nocturia in the International Prostate Symptom Score for benign prostatic hyperplasia. J Urol 2002; Jan;167(1):172-6.

606. Yoshimura K, Ohara H, Ichioka K, Terada N, Matsui Y, Terai A, et al. Nocturia and benign prostatic hyperplasia. Urology 2003; Apr;61(4):786-90.

607. Bruskewitz RC, Larsen EH, Madsen PO, Dorflinger T. 3-Year Followup of Urinary Symptoms After Transurethral Resection of the Prostate. J Urol 1986; Sep;136(3):613-5.

608. Johnson TM, Burrows PK, Kusek JW, Nyberg LM, Tenover JL, Lepor H, et al. The effect of doxazosin, finasteride and combination therapy on nocturia in men with benign prostatic hyperplasia. J Urol 2007; Nov;178(5):2045,50; discussion 2050-1.

609. Brown CT, O'Flynn E, Van Der Meulen J, Newman S, Mundy AR, Emberton M. The fear of prostate cancer in men with lower urinary tract symptoms: should symptomatic men be screened?. BJU Int 2003; Jan;91(1):30-2.

610. Young JM, Muscatello DJ, Ward JE. Are men with lower urinary tract symptoms at increased risk of prostate cancer? A systematic review and critique of the available evidence. BJU Int 2000; Jun;85(9):1037-48.

611. Martin RM, Vatten L, Gunnell D, Romundstad P, Nilsen TI. Lower urinary tract symptoms and risk of prostate cancer: the HUNT 2 Cohort, Norway. Int J Cancer 2008; Oct 15;123(8):1924-8.

612. Damber JE, Aus G. Prostate cancer. Lancet 2008; May 17;371(9625):1710-21.

613. Sanda MG, Dunn RL, Michalski J, Sandler HM, Northouse L, Hembroff L, et al. Quality of life and satisfaction with outcome among prostate-cancer survivors. N Engl J Med 2008; Mar 20;358(12):1250-61.

614. Namiki S, Saito S, Ishidoya S, Tochigi T, Ioritani N, Yoshimura K, et al. Adverse effect of radical prostatectomy on nocturia and voiding frequency symptoms. Urology 2005; Jul;66(1):147-51.

615. Namiki S, Ishidoya S, Saito S, Satoh M, Tochigi T, Ioritani N, et al. Natural history of voiding function after radical retropubic prostatectomy. Urology 2006; Jul;68(1):142-7.

616. Asplund R. Nocturia in relation to sleep, somatic diseases and medical treatment in the elderly. BJU Int 2002; Oct;90(6):533-6.

617. Lee WC, Wu HP, Tai TY, Liu SP, Chen J, Yu HJ. Effects of diabetes on female voiding behavior. J Urol 2004; Sep;172(3):989-92.

618. Fitzgerald MP, Mulligan M, Parthasarathy S. Nocturic frequency is related to severity of obstructive sleep apnea, improves with continuous positive airways treatment. Am J Obstet Gynecol 2006; May;194(5):1399-403.

619. Sarma AV, Burke JP, Jacobson DJ, McGree ME, St Sauver J, Girman CJ, et al. Associations between diabetes and clinical markers of benign prostatic hyperplasia among community-dwelling Black and White men. Diabetes Care 2008; Mar;31(3):476-82.

620. McKeigue PM, Reynard JM. Relation of nocturnal polyuria of the elderly to essential hypertension. Lancet 2000; Feb 5;355(9202):486-8.

621. Hall SA, Chiu GR, Kaufman DW, Wittert GA, Link CL, McKinlay JB. Commonly used antihypertensives and lower urinary tract symptoms: results from the Boston Area Community Health (BACH) Survey. BJU Int 2011; Sep 27;.

622. Bulpitt CJ, Connor M, Schulte M, Fletcher AE. Bisoprolol and nifedipine retard in elderly hypertensive patients: effect on quality of life. J Hum Hypertens 2000; Mar;14(3):205-12.

623. Reynard JM, Cannon A, Yang Q, Abrams P. A novel therapy for nocturnal polyuria: a double-blind randomized trial of frusemide against placebo. Br J Urol 1998; Feb;81(2):215-8.

624. Asplund R, Johansson S, Henriksson S, Isacsson G. Nocturia, depression and antidepressant medication. BJU Int 2005; Apr;95(6):820-3.

625. Hakkinen JT, Shiri R, Koskimaki J, Tammela TL, Auvinen A, Hakama M. Depressive symptoms increase the incidence of nocturia: Tampere Aging Male Urologic Study (TAMUS). J Urol 2008; May;179(5):1897-901.

626. Krieger J, Petiau C, Sforza E, Delanoe C, Hecht MT, Chamouard V. Nocturnal pollakiuria is a symptom of obstructive sleep apnea. Urol Int 1993;50(2):93-7.

627. Pressman MR, Figueroa WG, Kendrick-Mohamed J, Greenspon LW, Peterson DD. Nocturia. A rarely recognized symptom of sleep apnea and other occult sleep disorders. Arch Intern Med 1996; Mar 11;156(5):545-50.

628. Lowenstein L, Kenton K, Brubaker L, Pillar G, Undevia N, Mueller ER, et al. The relationship between obstructive sleep apnea, nocturia, and daytime overactive bladder syndrome in women. Am J Obstet Gynecol 2008; May;198(5):598.e1,598.e5.

629. Endeshaw Y. Correlates of self-reported nocturia among community-dwelling older adults. J Gerontol A Biol Sci Med Sci 2009; Jan;64(1):142-8.

630. Umlauf MG, Chasens ER, Greevy RA, Arnold J, Burgio KL, Pillion DJ. Obstructive sleep apnea, nocturia and polyuria in older adults. Sleep 2004; Feb 1;27(1):139-44.

631. Kinn AC, Harlid R. Snoring as a cause of nocturia in men with lower urinary tract symptoms. Eur Urol 2003; Jun;43(6):696-701.

632. Compston A, Coles A. Multiple sclerosis. Lancet 2002; Apr 6;359(9313):1221-31.

633. DasGupta R, Fowler CJ. Bladder, bowel and sexual dysfunction in multiple sclerosis: management strategies. Drugs 2003;63(2):153-66.

634. Young A, Home M, Churchward T, Freezer N, Holmes P, Ho M. Comparison of sleep disturbance in mild versus severe Parkinson's disease. Sleep 2002; Aug 1;25(5):573-7.

635. Bump, R. C., Mattiasson, A., Bo, K. et al.: The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. Am J Obstet Gynecol, 175: 10, 1996.

636. Hall, A. F., Theofrastous, J. P., Cundiff, G. W. et al.: Interobserver and intraobserver reliability of the proposed International Continence Society, Society of Gynecologic Surgeons, and American Urogynecologic Society pelvic organ prolapse classification system. Am J Obstet Gynecol, 175: 1467, 1996.

637. Weber, A. M., Abrams, P., Brubaker, L. et al.: The standardization of terminology for researchers in female pelvic floor disorders. Int Urogynecol J Pelvic Floor Dysfunct, 12: 178, 2001.

638. Ellerkmann, R. M., Cundiff, G. W., Melick, C. F. et al.: Correlation of symptoms with location and severity of pelvic organ prolapse. Am J Obstet Gynecol, 185: 1332, 2001.

639. Lukacz, E. S., Lawrence, J. M., Buckwalter, J. G. et al.: Epidemiology of prolapse and incontinence questionnaire: validation of a new epidemiologic survey. Int Urogynecol J Pelvic Floor Dysfunct, 16: 272, 2005.

640. Ghetti, C., Gregory, W. T., Edwards, S. R. et al.: Pelvic organ descent and symptoms of pelvic floor disorders. Am J Obstet Gynecol, 193: 53, 2005.

641. Swift, S. E.: The distribution of pelvic organ support in a population of female subjects seen for routine gynecologic health care. Am J Obstet Gynecol, 183: 277, 2000.

642. Hendrix, S. L., Clark, A., Nygaard, I. et al.: Pelvic organ prolapse in the Women's Health Initiative: gravity and gravidity. Am J Obstet Gynecol, 186: 1160, 2002.

643. Handa, V. L., Garrett, E., Hendrix, S. et al.: Progression and remission of pelvic organ prolapse: a longitudinal study of menopausal women. Am J Obstet Gynecol, 190: 27, 2004.

644. Lawrence, J. M., Lukacz, E. S., Nager, C. W. et al.: Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. Obstet Gynecol, 111: 678, 2008.

645. Bradley, C. S., Zimmerman, M. B., Qi, Y. et al.: Natural history of pelvic organ prolapse in postmenopausal women. Obstet Gynecol, 109: 848, 2007.

646. Nygaard, I., Bradley, C., Brandt, D.: Pelvic organ prolapse in older women: prevalence and risk factors. Obstet Gynecol, 104: 489, 2004.

647. Tegerstedt, G., Hammarstrom, M.: Operation for pelvic organ prolapse: a follow-up study. Acta Obstet Gynecol Scand, 83: 758, 2004.

648. Rortveit, G., Brown, J. S., Thom, D. H. et al.: Symptomatic pelvic organ prolapse: prevalence and risk factors in a population-based, racially diverse cohort. Obstet Gynecol, 109: 1396, 2007.

649. Eva, U. F., Gun, W., Preben, K.: Prevalence of urinary and fecal incontinence and symptoms of genital prolapse in women. Acta Obstet Gynecol Scand, 82: 280, 2003.

650. Samuelsson, E. C., Victor, F. T., Tibblin, G. et al.: Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. Am J Obstet Gynecol, 180: 299, 1999.

651. Kumari, S., Walia, I., Singh, A.: Self-reported uterine prolapse in a resettlement colony of north India. J Midwifery Womens Health, 45: 343, 2000.

652. MacLennan, A. H., Taylor, A. W., Wilson, D. H. et al.: The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. BJOG, 107: 1460, 2000.

653. Mant, J., Painter, R., Vessey, M.: Epidemiology of genital prolapse: observations from the Oxford Family Planning Association Study. Br J Obstet Gynaecol, 104: 579, 1997.

654. Boyles, S. H., Weber, A. M., Meyn, L.: Procedures for pelvic organ prolapse in the United States, 1979-1997. Am J Obstet Gynecol, 188: 108, 2003.

655. Brown, J. S., Waetjen, L. E., Subak, L. L. et al.: Pelvic organ prolapse surgery in the United States, 1997. Am J Obstet Gynecol, 186: 712, 2002.

656. Olsen, A. L., Smith, V. J., Bergstrom, J. O. et al.: Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. Obstet Gynecol, 89: 501, 1997.

657. Shah, A. D., Kohli, N., Rajan, S. S. et al.: The age distribution, rates, and types of surgery for pelvic organ prolapse in the USA. Int Urogynecol J Pelvic Floor Dysfunct, 19: 421, 2008.

658. Raza-Khan F, Cunkelman J, Lowenstein L, Shott S, Kenton K. Prevalence of bowel symptoms in women with pelvic floor disorders. Int J Urogynecol 2010 Aug;21(8):933-8. Epub 2010 May 7.

659. Peppas G, Alexiou VG, Mourtzoukou E, Falagas ME. Epidemiology of constipation in Europe and Oceania: a systematic review. BMC Gastroenterol. 2008 Feb 12;8:5. Review.

660. Jelovsek JE, Barber MD, Paraiso MF, Walters MD. Functional bowel and anorectal disorders in patients with pelvic organ prolapse and incontinence. Am J Obstet Gynecol 2005;193:2105-11.

661. Kahn MA, Breitkopf CR, Valley MT, Woodman PJ, O'Boyle AL, Bland DI, Schaffer JI, Grady JJ, Swift SE. Pelvic Organ Support Study (POSST) and bowel symptoms: straining at stool is associated with perineal and anterior vaginal descent in a general gynecologic population. Am J Obstet Gynecol 2005;192:1516-22.

662. Morgan DM, DeLancey JO, Guire KE, Fenner DE. Symptoms of anal incontinence and difficult defecation among women with prolapse and a matched control cohort. Am J Obstet Gynecol 2007;197:509 e1-6.

663. Snooks SJ, Barnes PR, Swash M, Henry MM. Damage to the innervation of the pelvic floor musculature in chronic constipation. Gastroenterology. 1985;89:977-81.

664. Lembo A, Camilleri M. Chronic constipation. N Engl J Med 2003;349:1360-8.

665. Spence-Jones C, Kamm MA, Henry MM, Hudson CN. Bowel dysfunction: a pathogenic factor in uterovaginal prolapse and urinary stress incontinence. Br J Obstet Gynaecol 1994;101:147-52.

666. Arya LA, Novi JM, Shaunik A, Morgan MA, Bradley CS. Pelvic organ prolapse, constipation, and dietary fiber intake in women: a case-control study. Am J Obstet Gynecol 2005;192:1687-91.

667. Rortveit G, Brown JS, Thom DH, Van Den Eeden SK, Creasman JM, Subak LL. Symptomatic pelvic organ prolapse: prevalence and risk factors in a population-based, racially diverse cohort. Obstet Gynecol 2007;109:1396-403.

668. Varma MG, Hart SL, Brown JS, Creasman JM, Van Den Eeden SK, Thom DH. Obstructive Defecation in Middle-aged Women. Dig Dis Sci 2008.

669. Hendrix SL, Clark A, Nygaard I, Aragaki A, Barnabei V, McTiernan A. Pelvic organ prolapse in the Women's Health Initiative: gravity and gravidity. Am J Obstet Gynecol 2002;186:1160-6.

670. Tegerstedt G, Maehle-Schmidt M, Nyren O, Hammarstrom M. Prevalence of symptomatic pelvic organ prolapse in a Swedish population. Int Urogynecol J Pelvic Floor Dysfunct 2005;16:497-503.

671. Bradley CS, Kennedy CM, Nygaard IE. Pelvic floor symptoms and lifestyle factors in older women. J Womens Health (Larchmt) 2005;14:128-36.

672. Yoshioka K, Matsui Y, Yamada O, Sakaguchi M, Takada H, Hioki K, Yamamoto M, Kitada M, Sawaragi I. Physiologic and anatomic assessment of patients with rectocele. Diseases of the Colon & Rectum. 1991;34:704-8.

673. Kelvin FM, Maglinte DD, Hornback JA, Benson JT. Pelvic prolapse: assessment with evacuation proctography (defecography)[comment]. Radiology. 1992;184:547-51.

674. Altman D, Lopez A, Kierkegaard J, Zetterstrom J, Falconer C, Pollack J, Mellgren A. Assessment of posterior vaginal wall prolapse: comparison of physical findings to cystodefecoperitoneography. Int Urogynecol J Pelvic Floor Dysfunct 2005;16:96-103; discussion 103.

675. Weber AM, Walters MD, Ballard LA, Booher DL, Piedmonte MR. Posterior vaginal prolapse and bowel function. American Journal of Obstetrics & Gynecology. 1998;179:1446-9; discussion 1449-50.

676. Ellerkmann RM, Cundiff GW, Melick CF, Nihira MA, Leffler K, Bent AE. Correlation of symptoms with location and severity of pelvic organ prolapse. American Journal of Obstetrics & Gynecology. 2001;185:1332-7.

677. Bradley CS, Brown MB, Cundiff GW, Goode PS, Kenton KS, Nygaard IE, Whitehead WE, Wren PA, Weber AM. Bowel symptoms in women planning surgery for pelvic organ prolapse. Am J Obstet Gynecol 2006.

678. Klingele CJ, Bharucha AE, Fletcher JG, Gebhart JB, Riederer SG, Zinsmeister AR. Pelvic organ prolapse in defecatory disorders. Obstet Gynecol 2005;106:315-20.

679. Saks EK, Harvie HS, Asfaw TS, Arya LA. Clinical significance of obstructive defecatory symptoms in women with pelvic organ prolapse. Int J Gynaecol Obstet. 2010 Dec;111(3):237-40.

680. Wang J, Varma MG, Creasman JM, Subak LL, Brown JS, Thom DH, van den Eeden SK. Pelvic floor disorders and quality of life in women with self-reported irritable bowel syndrome. Aliment Pharmacol Ther. 2010 Feb 1;31(3):424-31. Epub 2009 Oct 23.

681. Mellgren A, López A, Schultz I, Anzén B. Rectocele is associated with paradoxical anal sphincter reaction. Int J Colorectal Dis. 1998;13(1):13-6.

682. Altman D, Falconer C, Cnattingius S, Granath F. Pelvic organ prolapse surgery following hysterectomy on benign indications. Am J Obstet Gynecol 2008.

683. Cooper K, Lee A, Chien P, Raja E, Timmaraju V, Bhattacharya S. Outcomes following hysterectomy or endometrial ablation for heavy menstrual bleeding: retrospective analysis of hospital episode statistics in Scotland. BJOG. 2011 Sep;118(10):1171-9. doi: 10.1111/j.1471-0528.2011.03011.x. Epub 2011 May 31.

684. Mant J, Painter R, Vessey M. Epidemiology of genital prolapse: observations from the Oxford Family Planning Association Study. British Journal of Obstetrics & Gynaecology. 1997;104:579-85.

685. Swift SE, Pound T, Dias JK. Case-control study of etiologic factors in the development of severe pelvic organ prolapse. Int Urogynecol J Pelvic Floor Dysfunct 2001;12:187-92.

686. Swift SE. The distribution of pelvic organ support in a population of female subjects seen for routine gynecologic health care. Am J Obstet Gynecol 2000;183:277-85.

687. Dallenbach P, Kaelin-Gambirasio I, Dubuisson JB, Boulvain M. Risk factors for pelvic organ prolapse repair after hysterectomy. Obstet Gynecol 2007;110:625-32.

688. Forsgren C, Zetterstrom J, Lopez A, Nordenstam J, Anzen B, Altman D. Effects of hysterectomy on bowel function: a three-year, prospective cohort study. Dis Colon Rectum 2007;50:1139-45.

689. DeLancey JO. Anatomic aspects of vaginal eversion after hysterectomy. Am J Obstet Gynecol 1992;166:1717-28.

690. Marchionni M, Bracco GL, Checcucci V, Carabaneanu A, Coccia EM, Mecacci F, Scarselli G. True incidence of vaginal vault prolapse. Thirteen years of experience. J Reprod Med 1999;44:679-84.

691. Forsgren C, Lundholm C, Johansson AL, Cnattingius S, Zetterström J, Altman D.Vaginal hysterectomy and risk of pelvic organ prolapse and stress urinary incontinence surgery. Int Urogynecol J. 2012 Jan;23(1):43-8. Epub 2011 Aug 18.

692. Altman D, Zetterstrom J, Schultz I, Nordenstam J, Hjern F, Lopez A, Mellgren A. Pelvic organ prolapse and urinary incontinence in women with surgically managed rectal prolapse: a population-based case-control study. Dis Colon Rectum 2006;49:28-35.

693. Moalli PA, Jones Ivy S, Meyn LA, Zyczynski HM. Risk factors associated with pelvic floor disorders in women undergoing surgical repair. Obstet Gynecol 2003;101:869-74.

694. Wiskind AK, Creighton SM, Stanton SL. The incidence of genital prolapse after the Burch colposuspension. Am J Obstet Gynecol 1992;167:399-404; discussion 404-5.

695. Kjölhede P. Genital prolapse in women treated successfully and unsuccessfully by the Burch colposuspension. Acta Obstet Gynecol Scand 1998;77:444-50.

696. Denman M, Gregory W, Boyles S, Smith V, Edwards S, Clark A. Reoperation 10 years after surgically managed pelvic organ prolapse and urinary incontinence. Am J Obstet Gynecol 2008;198:555.e1-5.

697. O'Boyle AL, Woodman PJ, O'Boyle JD, Davis GD, Swift SE. Pelvic organ support in nulliparous pregnant and nonpregnant women: a case control study. Am J Obstet Gynecol 2002;187:99-102.

698. Sze EH, Sherard GB, 3rd, Dolezal JM. Pregnancy, labor, delivery, and pelvic organ prolapse. Obstet Gynecol 2002;100:981-6.

699. Sze EH, Jones WP, Ferguson JL, Barker CD, Dolezal JM. Prevalence of urinary incontinence symptoms among black, white, and Hispanic women. Obstet Gynecol 2002;99:572-5.

700. Carley ME, Turner RJ, Scott DE, Alexander JM. Obstetric history in women with surgically corrected adult urinary incontinence or pelvic organ prolapse. Journal of the American Association of Gynecologic Laparoscopists 1999;6:85-9.

701. Lukacz ES, Lawrence JM, Contreras R, Nager CW, Luber KM. Parity, mode of delivery, and pelvic floor disorders. Obstet Gynecol 2006;107:1253-60.

702. Uma R, Libby G, Murphy DJ. Obstetric management of a woman's first delivery and the implications for pelvic floor surgery in later life. Bjog 2005;112:1043-6.

703. Tegerstedt G, Miedel A, Maehle-Schmidt M, Nyren O, Hammarstrom M. Obstetric risk factors for symptomatic prolapse: a population-based approach. Am J Obstet Gynecol 2006;194:75-81.

704. Fritel X, Varnoux N, Zins M, Breart G, Ringa V. Symptomatic pelvic organ prolapse at midlife, quality of life, and risk factors. Obstet Gynecol. 2009 Mar;113(3):609-16.

705. Quiroz LH, Muñoz A, Shippey SH, Gutman RE, Handa VL. Vaginal parity and pelvic organ prolapse. J Reprod Med. 2010 Mar-Apr;55(3-4):93-8.

706. Chiaffarino F, Chatenoud L, Dindelli M, Meschia M, Buonaguidi A, Amicarelli F, Surace M, Bertola E, Di Cintio E, Parazzini F. Reproductive factors, family history, occupation and risk of urogenital prolapse. European Journal of Obstetrics, Gynecology, & Reproductive Biology 1999;82:63-7.

707. MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. BJOG: an International Journal of Obstetrics & Gynaecology 2000;107:1460-70.

708. Risk factors for genital prolapse in non-hysterectomized women around menopause. Results from a large cross-sectional study in menopausal clinics in Italy. Progetto Menopausa Italia Study Group. Eur J Obstet Gynecol Reprod Biol 2000;93:135-40.

709. Leijonhufvud A, Lundholm C, Cnattingius S, Granath F, Andolf E, Altman D. Risks of stress uriunary incontinence and pelvic organ prolapse surgewry in relation to mode of childbirth. Am J Obstet Gynecol. 2011 Jan;204(1):70.e1-7.

710. Handa VL, Blomquist JL, Knoepp LR, Hoskey KA, McDermott KC, Muñoz A. Pelvic floor disorders 5-10 years 5-10 years after vaginal or cesarean birth. Obstet Gynecol. 2011 Oct;118(4):777-84.

711. Carley ME, Schaffer J. Urinary incontinence and pelvic organ prolapse in women with Marfan or Ehlers Danlos syndrome. American Journal of Obstetrics & Gynecology. 2000;182:1021-3.

712. McIntosh LJ, Mallett VT, Frahm JD, Richardson DA, Evans MI. Gynecologic disorders in women with Ehlers-Danlos syndrome. J Soc Gynecol Investig 1995;2:559-64.

713. Scherf C, Morison L, Fiander A, Ekpo G, Walraven G. Epidemiology of pelvic organ prolapse in rural Gambia, West Africa. BJOG: an International Journal of Obstetrics & Gynaecology 2002;109:431-6.

714. Lind LR, Lucente V, Kohn N. Thoracic kyphosis and the prevalence of advanced uterine prolapse. Obstet Gynecol 1996;87:605-9.

715. Nguyen JK, Lind LR, Choe JY, McKindsey F, Sinow R, Bhatia NN. Lumbosacral spine and pelvic inlet changes associated with pelvic organ prolapse. Obstet Gynecol 2000;95:332-6.

716. Marshman D, Percy J, Fielding I, Delbridge L. Rectal prolapse: relationship with joint mobility. Australian & New Zealand Journal of Surgery 1987;57:827-9.

717. Norton PA, Baker JE, Sharp HC, Warenski JC. Genitourinary prolapse and joint hypermobility in women. Obstetrics & Gynecology. 1995;85:225-8.

718. Pandey S, Bhattacharya S. Impact of obesity on gynecology. Womens Health (Lond Engl). 2010 Jan;6(1):107-17. Review.

719. Washington BB, Erekson EA, Kassis NC, Myers DL. The association between obesity and stage II or greater prolapse. Am J Obstet Gynecol. 2010 May;202(5):503.e1-4. Epub 2010 Feb 20.

720. Samuelsson EC, Arne Victor FT, Tibblin G, Svardsudd KF. Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. American Journal of Obstetrics & Gynecology 1999;180:299-305.

721. Forsman M, Iliadou A, Magnusson P, Falconer C, Altman D. Diabetes and obesity-related risks for pelvic reconstructive surgery in a cohort of Swedish twins. Diabetes Care. 2008 Oct;31(10):1997-9. Epub 2008 Jul 15.

722. Strinic T, Eterovic D, Dujic Z, Markovic V, Tocilj J. Spirometric disorders in women with genital descensus. Acta Obstet Gynecol Scand 1997;76:879-83.

723. Nygaard I, Bradley C, Brandt D. Pelvic organ prolapse in older women: prevalence and risk factors. Obstet Gynecol 2004;104:489-97.

724. Woodman PJ, Swift SE, O'Boyle AL, Valley MT, Bland DR, Kahn MA, Schaffer JI. Prevalence of severe pelvic organ prolapse in relation to job description and socioeconomic status: a multicenter cross-sectional study. Int Urogynecol J Pelvic Floor Dysfunct 2006;17:340-5.

725. Strinic T, Bukovic D, Roje D, Milic N, Pavic M, Turcic P. Epidemiology of pelvic floor disorders between urban and rural female inhabitants. Coll Antropol 2007;31:483-7.

726. Walker GJ, Gunasekera P. Pelvic organ prolapse and incontinence in developing countries: review of prevalence and risk factors. Int Urogynecol J. 2011 Feb;22(2):127-35. Epub 2010 Jul 9. Review.

727. Jorgensen S, Hein HO, Gyntelberg F. Heavy lifting at work and risk of genital prolapse and herniated lumbar disc in assistant nurses. Occup Med (Lond) 1994;44:47-9.

728. Larsen WI, Yavorek T. Pelvic prolapse and urinary incontinence in nulliparous college women in relation to paratrooper training. Int Urogynecol J Pelvic Floor Dysfunct 2007;18:769-71.

729. Thompson H. On irritability of the bladder. The Lancet. 1854;63(1607):637–638.

730. Diokno AC, Brock BM, Herzog AR, Bromberg J. Medical correlates of urinary incontinence in the elderly. URL. 1990 Aug.;36(2):129–138.

731. Mushkat Y, Bukovsky I, Langer R. Female urinary stress incontinence--does it have familial prevalence? Am J Obstet Gynecol 1996;174:617-9.

732. Hannestad YS, Lie RT, Rortveit G, Hunskaar S. Familial risk of urinary incontinence in women: population based cross sectional study. BMJ 2004;329:889-91.

733. Elia G, Bergman J. Familial incidence of urinary incontinence. Am. J. Obstet. Gynecol. 2002;187:53–55.

734. Ertunc D, Tok E, Pata O, Dilek U. Is stress urinary incontinence a familial condition? Acta Obstet Gynecol Scand 2004;83:912-6.

735. Buchsbaum GM, Duecy EE, Kerr LA, Huang L-S, Guzick DS. Urinary incontinence in nulliparous women and their parous sisters. Obstet Gynecol. 2005 Dec.;106(6):1253–1258.

736. Lapitan MC, Chye PL; Asia-Pacific Continence Advisory Board. The epidemiology of overactive bladder among females in Asia: a questionnaire survey. Int Uroggynecol J Pelvic Floor Dysfunct 2001;12(4):226-31.

737. Torrisi G, Sampugnaro EG, Pappalardo EM, D'Urso E, Vecchio M, Mazza A. Postpartum urinary stress incontinence: analysis of the associated risk factors and neurophysiological tests. Minerva Ginecol. 2007 Oct.;59(5):491–498.

738. Chaliha C, Kalia V, Stanton SL, Monga A, Sultan AH. Antenatal prediction of postpartum urinary and fecal incontinence. Obstet Gynecol. 1999 Nov.;94(5 Pt 1):689–694.

739. Torrisi G, Minini G, Bernasconi F, Perrone A, Trezza G, Guardabasso V, et al. A prospective study of pelvic floor dysfunctions related to delivery. Eur. J. Obstet. Gynecol. Reprod. Biol. 2011 Nov. 15;

740. Rinne K. What predisposes young women to genital prolapse? European Journal of Obstetrics, Gynecology, & Reproductive Biology. 1999;84:23-5.

741. Rechberger T, Miotła P, Futyma K, Bartuzi A, Basta A, Opławski M, et al. [Risk factors of pelvic organ prolapsed in women qualified to reconstructive surgery--the Polish multicenter study]. Ginekol. Pol. 2010 Nov.;81(11):821–827.

742. Jack GS, Nikolova G, Vilain E, Raz S, Rodríguez LV. Familial tranmission of genitovaginal prolapse. Int Urogynecol J. 2005 Dec. 20;17(5):498–501.

743. Chiaffarino F, Chatenoud L, Dindelli M, Meschia M, Buonaguidi A, Amicarelli F, Surace M, Bertola E, Di Cintio E, Parazzini F. Reproductive factors, family history, occupation and risk of urogenital prolapse. European Journal of Obstetrics, Gynecology, & Reproductive Biology 1999;82:63-7.

744. McLennan MT, Harris JK, Kariuki B, Meyer S. Family history as a risk factor for pelvic organ prolapse. Int Urogynecol J Pelvic Floor Dysfunct 2008.

745. Slieker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Symptomatic pelvic organ prolapse and possible risk factors in a general population. Am J Obstet Gynecol. 2009 Feb;200(2):184.e1-7. Epub 2008 Dec 25.

746. Mathlouthi N, Ben Ayed B, Dhouib M, Chaabene K, Trabelsi K, Amouri H, et al. Genital prolapse in young women: a study of risk factors. Tunis Med. 2011 Jul.;89(7):627–631.

747. Buchsbaum GM, Duecy EE. Incontinence and pelvic organ prolapse in parous/nulliparous pairs of identical twins. Neurourol. Urodyn. 2008;27(6):496–498.

748. Nguyen A, Aschkenazi SO, Sand PK, Du H, Botros SM, Gamble TL, et al. Nongenetic factors associated with stress urinary incontinence. Obstet Gynecol. 2011 Feb.;117(2 Pt 1):251–255.

749. Rohr G, Kragstrup J, Gaist D, Christensen K. Genetic and environmental influences on urinary incontinence: a Danish population-based twin study of middle-aged and elderly women. Acta Obstet Gynecol Scand. 2004 Oct.;83(10):978–982.

750. Altman D, Forsman M, Falconer C, Lichtenstein P. Genetic influence on stress urinary incontinence and pelvic organ prolapse. Eur. Urol. 2008 Oct.;54(4):918–922.

751. Wennberg A-L, Altman D, Lundholm C, Klint A, Iliadou A, Peeker R, et al. Genetic influences are important for most but not all lower urinary tract symptoms: a population-based survey in a cohort of adult Swedish twins. Eur. Urol. 2011 Jun.;59(6):1032–1038.

752. Hansell NK, Dietz HP, Treloar SA, Clarke B, Martin NG. Genetic covariation of pelvic organ and elbow mobility in twins and their sisters. Twin Res. 2004 Jun.;7(3):254–260.

753. Dietz HP, Hansell NK, Grace ME, Eldridge AM, Clarke B, Martin NG. Bladder neck mobility is a heritable trait. BJOG: An International Journal of Obstetrics & Gynaecology. 2005 Mar.;112(3):334–339.

754. Gontard von A, Schaumburg H, Hollmann E, Eiberg H, Rittig S. The genetics of enuresis: a review. J. Urol. 2001 Dec.;166(6):2438–2443.

755. Nikolova G, Lee H, Berkovitz S, Nelson S, Sinsheimer J, Vilain E, et al. Sequence variant in the laminin gamma1 (LAMC1) gene associated with familial pelvic organ prolapse. Hum. Genet. 2007 Feb.;120(6):847–856.

756. Ioannidis JP, Boffetta P, Little J, O'Brien TR, Uitterlinden AG, Vineis P, et al. Assessment of cumulative evidence on genetic associations: interim guidelines. International Journal of Epidemiology. 2007 Dec. 3;37(1):120–132.

757. Skorupski P, Król J, Starega J, Adamiak A. An [alpha]-1 chain of type I collagen Sp1-binding site polymorphism in women suffering from stress urinary incontinence. Am J Obstet Gynecol. 2006 Feb;194(2):346-50.

758. Sioutis D, Economou E, Lambrinoudaki I, Tsamadias V, Creatsa M, Liapis A. Sp1 collagen I A1 polymorphism in women with stress urinary incontinence. Int Urogynecol J. 2011 Jul.;22(7):835–839.

759. Ferreira CE, Fonseca AM, Silva ID, Girão MJ, Sartori MG, Castro RA. The relationship between the Trp 64 Arg polymorphism of the beta 3-adrenoceptor gene and idiopathic overactive bladder. Am J Obstet Gynecol. 2011 Jul;205(1):82.e10-4. Epub 2011 Feb 23.

760. Honda et al. Mutation of B3-Adrenoceptor gene: a genetic marker for overactive bladder. Neurourol. Urodyn. 2006 Jul. 26;25:652.

761. Schwanke CHA, Bittencourt L, Noronha JAP, Augustin SAJ, Jung IE, Cruz IBM. Is there an association between T102C polymorphism of the serotonin receptor 2A gene and urinary incontinence? Braz. J. Med. Biol. Res. 2007 Oct.;40(10):1315–1322.

762. Noronha JAP, Schwanke CHA, Machado DC, Braga R, Lubianca JM, Sesti FL, et al. Association between T102C polymorphism of serotonin 2A receptor gene and urinary incontinence in older women. J. Investig. Med. 2010 Jan.;58(1):32–37.

763. Ozbek et al. Tt polymorphism in rs 2165241 region and cc polymorphism in rs 3825942 region in lysyl oxidase like-1 (lox-l1) gene may play a role in stress urinary incontinence pathophysiology. European Urology, Supplements. 2011;10(2):291.

764. Skorupski P, Miotła P, Jankiewicz K, Rechberger T. [MMP-1 and MMP-3 gene encoding polymorphism and the risk of the development of pelvic organ prolapse and stress urinary incontinence]. Ginekol. Pol. 2010 Aug.;81(8):594–599.

765. Vishwajit S et al. Association of MMP1 promoter variant with stress urinary incontinence and pelvic organ prolapse in women. J. Urol. 2009 Apr. 28;191(4):481.

766. Cornu JN, Merlet B, Cussenot O, Cancel-Tassin G, Ciofu C, Amarenco G, et al. Genetic susceptibility to urinary incontinence: implication of polymorphisms of androgen and oestrogen pathways. World J Urol. 2011 Apr.;29(2):239–242.

767. Skorupski P, Król J, Starega J, Adamiak A, Jankiewicz K, Rechberger T. An alpha-1 chain of type I collagen Sp1-binding site polymorphism in women suffering from stress urinary incontinence. Am. J. Obstet. Gynecol. 2006 Feb.;194(2):346–350.

768. Skorupski P, Miotła P, Jankiewicz K, Rechberger T. Polymorphism of the gene encoding alpha-1 chain of collagen type I and a risk of pelvic organ prolapse--a preliminary study. Ginekol. Pol. 2007 Nov.;78(11):852–855.

769. Rodrigues AM, Girão MJBC, da Silva IDCG, Sartori MGF, Martins K de F, Castro R de A. COL1A1 Sp1-binding site polymorphism as a risk factor for genital prolapse. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Nov.;19(11):1471–1475.

770. Feiner B, Fares F, Azam N, Auslender R, David M, Abramov Y. Does COLIA1 SP1-binding site polymorphism predispose women to pelvic organ prolapse? Int Urogynecol J Pelvic Floor Dysfunct. 2009 Sep.;20(9):1061–1065.

771. Cho HJ, Jung HJ, Kim SK, Choi JR, Cho NH, Bai SW. Polymorphism of a COLIA1 gene Sp1 binding site in Korean women with pelvic organ prolapse. Yonsei Med. J. 2009 Aug. 31;50(4):564–568.

772. Martins K de F, de Jármy-DiBella ZIK, da Fonseca AMRM, Castro RA, da Silva IDCG, Girão MJBC, et al. Evaluation of demographic, clinical characteristics, and genetic polymorphism as risk factors for pelvic organ prolapse in Brazilian women. Neurourol. Urodyn. 2011 Sep.;30(7):1325–1328.

773. Jeon MJ, Chung SM, Choi JR, Jung HJ, Kim SK, Bai SW. The relationship between COL3A1 exon 31 polymorphism and pelvic organ prolapse. J. Urol. 2009 Mar.;181(3):1213–1216.

774. Kluivers KB, Dijkstra JR, Hendriks JCM, Lince SL, Vierhout ME, van Kempen LCL. COL3A1 2209G>A is a predictor of pelvic organ prolapse. Int Urogynecol J Pelvic Floor Dysfunct. 2009 Sep.;20(9):1113–1118.

775. Chen H-Y, Chung Y-W, Lin W-Y, Wang J-C, Tsai F-J, Tsai C-H. Collagen type 3 alpha 1 polymorphism and risk of pelvic organ prolapse. Int J Gynaecol Obstet. 2008 Oct.;103(1):55–58.

776. Ferrell G, Lu M, Stoddard P, Sammel MD, Romero R, Strauss JF, et al. A single nucleotide polymorphism in the promoter of the LOXL1 gene and its relationship to pelvic organ prolapse and preterm premature rupture of membranes. Reprod Sci. 2009 May;16(5):438–446.

777. Fu R, Hagstrom S. Mutation screen of lysyl oxidase-like -1 and laminin. gamma 1 variant in patients with advanced female pelvic organ prolapse. J. Urol. 2009;181(4):481.

778. Chen C, Hill LD, Schubert CM, Strauss JF, Matthews CA. Is laminin gamma-1 a candidate gene for advanced pelvic organ prolapse? Am. J. Obstet. Gynecol. 2010 May;202(5):505.e1–5.

779. Romero A, Jamison M. Are Single Nucleotide Polymorphisms Associated With Pelvic Organ Prolapse? Female Pelvic Medicine & …. 2008

780. Campeau L et al. Characterization of SNPS within the MMP-1 promotor region in women with and without POP. Neurourol. Urodyn. 2011 Jun. 15;:1–1.

781. Chen H-Y, Lin W-Y, Chen Y-H, Chen W-C, Tsai F-J, Tsai C-H. Matrix metalloproteinase-9 polymorphism and risk of pelvic organ prolapse in Taiwanese women. Eur. J. Obstet. Gynecol. Reprod. Biol. 2010 Apr.;149(2):222–224.

782. Chen H-Y, Chung Y-W, Lin W-Y, Chen W-C, Tsai F-J, Tsai C-H. Estrogen receptor alpha polymorphism is associated with pelvic organ prolapse risk. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Aug.;19(8):1159–1163.

783. Chen H-Y, Wan L, Chung Y-W, Chen W-C, Tsai F-J, Tsai C-H. Estrogen receptor beta gene haplotype is associated with pelvic organ prolapse. Eur. J. Obstet. Gynecol. Reprod. Biol. 2008 May;138(1):105–109.

784. Chen H-Y, Chung Y-W, Lin W-Y, Chen W-C, Tsai F-J, Tsai C-H. Progesterone receptor polymorphism is associated with pelvic organ prolapse risk. Acta Obstet Gynecol Scand. 2009;88(7):835–838.

785. Allen-Brady K, Cannon-Albright L, Farnham JM, Teerlink C, Vierhout ME, van Kempen LC, Kluivers KB, Norton PA. Identification of six loci associated with pelvic organ prolapse using genome-wide association analysis. Obstet Gynecol. 2011 Dec;118(6):1345-53.

786. Titi M, Jenkins JT, Urie A, Molloy RG. Prospective study of the diagnostic evaluation of faecal incontinence and leakage in male patients. Colorectal Dis. 2007;9:647-52.

787. Leigh RJ, Turnberg LA. Faecal incontinence: the unvoiced symptom. Lancet. 1982;1:1349-1351.

788. Thomas TM, Egan M, Walgrove A, Meade TW. The prevalence of faecal and double incontinence. Comm Med.1984;6:216-220.

789. Nelson RL, Norton N, Cautley E, Furner S. Community based prevalence of AI. JAMA. 1995;274:559-562.

790. Sharma A, Marshjall RJ, MacMillan AK, Merrie AEH, Reid P, Bissett IP. Determining levels of fecal incontinence in the community: a New Zealand cross-sectional study. Dis. Colon Rectum. 2011;54:1381-7.

791. Macmillan AK, Merrie AEH, Marshall RJ, Parry BR. The prevalence of faecal incontinence in community dwelling adults: a systematic review. Dis. Colon & Rectum.2004.47.1341-49.

792. Bai Y, Chen H, Hao J, Huang Y, Wang W. Long term outcome and quality of life after the Swenson procedure for Hirschprung's disease. J Pediatric Surg. 2002;37:639-42.

793. Javid PJ, Barnhart DC, Hirschi RB, Coran AG, Harmon CM. Immediate and long term results of surgical management of low imperforate anus in girls. J Pediatric Surg. 1998;33:198-203.

794. Rintala RJ, Lindahl H. Is normal bowel function possible after repair of intermediate and high anorectal malformations? J Pediatric Surg. 1995;30:491-4.

795. Hartman EE, Oort FJ, Aronson DC, Hanneman JG, van der Zee DC, et al. Critical factors affecting the quality of life of adult patients with anorectal malformations or Hirschprung's Disease. Am J Gastroent.2004;xx:907-13.

796. Forrester MB, Merz RD. Descriptive epidemiology of anal atresia in Hawaii, 1986-1999. Teratology.2002;66supp.:S12-6.

797. Largo RH, Gianciaruso M, Prader A. Development of intestinal and bladder control from birth until the 18th year of age. Longitudinal Study. Schweiz Med Wochenschr. 1978;108:155-60.

798. Nelson RL, Chattopadhyay A, Brooks W, Platt I, Paavana T, Earl S. Operative procedures for fissure in ano. Cochrane Database Syst Rev. 2011 Nov 9;11: CD002199.

799. Nelson R. Anal fissure (chronic). Clin Evid (Online). 2010 Mar 24;2010. pii: 0407. PubMed PMID: 21718564.

800. Pretlove SJ, Thompson PJ, Toozs-Hobson PM, Radley S, Khan KS. Does the mode of delivery predispose women to anal incontinence in the first year postpartum? A comparative systematic review. BJOG. 2008 Mar;115(4):421-34. Review. Erratum in: BJOG. 2010 Sep;117(10):1307-8.

801. Nelson RL, Furner SE, Westercamp M, Farquhar C. Cesarean delivery for the

prevention of anal incontinence. Cochrane Database Syst Rev. 2010 Feb 17;(2) :CD006756. Review.

802. Small KA, Wynne JM. Evaluating the pelvic floor in obstetric patients. Aust New Zeal Obstet Gynecol. 1990;30:41-45.

803. Madoff RD, Williams JG, Caushaj PF. Current concepts: Fecal incontinence. N Engl J Med. 1992;326:1002-1007.

804. Abou-Zahr C. Obstructed labour. In: Murray CJL, Lopez AD, eds. Health dimensions of sex and reproduction: the global burden of sexually transmitted diseases, HIV, maternal conditions, perinatal disorders and congenital anomalies. Cambridge, Mass. Harvard University Press, 1996.

805. Drossman DA. What can be done to control incontinence associated with the irritable bowel syndrome? Am J Gastroenterol. 1989;84:355-357.

806. Schiller LR, Santa Ana CA, Schmulen AC, Hendler RS, Harford WV, Fordtran JS. Pathogenesis of fecal incontinence in diabetes mellitus. N Engl J Med. 1982;307:1666-1671.

807. Campbell AJ, Reinken J, McCosh L. Incontinence in the elderly: prevalence and prognosis. Age Ageing. 1985;14:65-70.

808. Denis P, Bercoff E, Bizien MF, Brocker P, Chassagne P, Lamouliatte H et al. Etude de la prevalence de l'incontinence anale chez l'adulte. Gastroent Clin Biol. 1992;16:344-350.

809. Drossman DA, Li Z, Andruzzi E, Temple RD, Talley NJ, Thompson WG et al. U.S. householder survey of functional gastrointestinal disorders: Prevalence, sociodemography, and health impact. Dig Dis Sci. 1993;38:1569-1580. 2001;114:474-477.

810. MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity, and mode of delivery. BJOG 2000;107:1460-1470.

811. Giebel GD, Lefering R, Troidl H, Blochl H. Prevalence of fecal incontinence: what can be expected? Int J Colorectal Dis. 1998;13:73-77.

812. Lam L, Kennedy M, Chen F. Prevalence of faecal incontinence: obstetric and constipation risk factors: a population based study. Colorectal Dis. 1999;1:197-203.

813. Kalantar JS, Howell S, Talley NJ. Prevalence of faecal incontinence and associated risk factors. Med J Aust. 2002;176:54-57.

814. Lynch AJ, Dobbs BR, Keating J, Frizelle FA. The prevalence of faecal incontinence and constipation in a general New Zealand population: a postal survey. NZ Med J 2001;114:474-477.

815. Perry S, Shaw C, McGrother C, Mathews RJ, Assassa RP, Dallosso H et al. Prevalence of faecal incontinence in adults aged 40 years or more living in the community. Gut. 2002;50: 480-484.

816. Chaliha C, Kalia V, Stanton SL, Monga A, Sultan AH. Antenatal prediction of postpartum urinary and fecal incontinence. Obstet Gynecol. 1999;94:689-694.

817. Eason E, Labrecque M, Marcoux S, Mondor M. AI after childbirth. CMAJ. 2002;166:326-330.

818. Sangalli MR, Floris L, Faltin D, Weil A. AI in women with third or fourth degree perineal tears and subsequent vaginal deliveries. Aust NZ J Obstet Gynaecol. 2000;40:244-248.

819. Okonkwo JE, Obionu CN, Okonkwo CV, Obiechina NJ. AI among Igbo women. Int J Clin Pract. 2002;56:178-180.

820. Rizk DE, Hassan MY, Shaheen H, Chervian JV, Micallef R, Dunn E. The prevalence and determinants of health care seeking behavior for fecal incontinence in multiparous United Arab Emirates females. Dis Colon Rectum. 2001;44:1850-1856.

821. Alnaif B, Drutz HP.The prevalence of urinary and fecal incontinence in Canadian secondary school teenage girls: questionnaire study and review of the literature. Int J Urogynecol/J Pelvic Floor Dysfunct. 2001;12:134-137.

822. Faltin DL, Sangalli MR, Curtin F, Morabia A, Weil A. Prevalence of AI and other anorectal symptoms in women. Int J Urogynecol/J Pelvic Floor Dysfunct. 2001;121: 117-120.

823. Ishigooka M, Hashimoto T, Izumiya K, Sasagawa I, Nakada T. Incidence of AI after long term follow up of patients treated by ureterosigmoidostomy. Int Urol Nephrol. 1993;25:455-460.

824. Adolfsson J, Helgason AR, Dickman P, Steineck G. Urinary and bowel symptoms in men with and without prostate cancer: results from an observational study in the Stockholm area. Eur Urol. 1998;33:11-16.

825. Bytzer P, Talley NJ, Leemon M, Young LJ, Jones MP, Horowitz M. Prevalence of gastrointestinal symptoms associated with diabetes mellitus: a population bases survey of 15000 adults. Arch Intern Med. 2001;161:1989-1996.

826. Kok ALM, Voorhorst FJ, Burger CW, van Houten P, Kenemans P, Jansens J. Urinary and faecal incontinence in community-residing elderly women. Age Ageing. 1992;21:211-215.

827. Talley NJ, O'Keefe EA, Zinsmeister AR, Melton LJ. Prevalence of gastrointestinal symptoms in the elderly: a population based study. Gastroenterol. 1992;102:895-901.

828. Nakanishi N, Tatara K, Nakajima K, Takabayashi H, Takahashi S, Naramura H et al. Urinary and fecal incontinence in a community-residing elderly population: prevalence, correlates and prognosis. Nippon Koshu Eisei Zasshi. 1997;44:192-200.

829. Roberts RO, Jacobsen SJ, Reilly WT, Pemberton JH, Lieber MM, Talley NJ. Prevalence of combined fecal and urinary incontinence: a community-based study. J Am Geriatr Soc. 1999;47:837-841.

830. Edwards NI, Jones D. The prevalence of faecal incontinence in older people living at home. Age Ageing. 2001;30:503-507.

831. Verhagen TE, Lagro-Janssen AL. Fecal incontinence in community dwelling elderly: findings from a study of prevalence, consultation of physicians, psychosocial aspects and treatment. Ned Tijdschr Geneeskd. 2001;145:741-745.

832. Tpokinova E, Neuwirth J, Stankova M, Mellanova A, Haas T. Urinary and fecal incontinence in geriatric facilities in the Czech Republic. Cas Lek Cesk. 1997;136:573-577.

833. Nelson RL, Furner S, Jesudason V. Fecal incontinence in Wisconsin nursing homes. Dis Colon Rectum. 1998;41:1226-1229.

834. Borrie MJ, Davidson HA. Incontinence in institutions: costs and contributing factors. CMAJ. 1992;147:322-328.

835. Damon H, Guye O, Seigneurin A,Long F, Faucheron AL, Grandjean JP, Mellier G, Vallancogne G, FayardO, Henry L, Guyot P, Barth X, Mion F. Prevalence of anal incontinence in adults impact on quality of life. Gastroenterologie. 2006;30:37-43.

836. Bharucha AE, Zinsmeister AR, Locke GR, Seide BM,,McKeon K, Schleck CD, Melton III J. Rick factors for fecal incontinence: a population-based study in women. Am J mGastro.2006;101:1305-12.

837. Fritel X, Ringa V, Varnoux N, Zins M, Breart G. Mode of delivery and fecal incontinence at midlife; a study of 2640 women in the Gazel cohort. Obstet Gynecol 2007;110:31-8.

838. Lawrence JM, Lukasz ES, Nager CW, Hsu JWY, Luber KM. Prevalence and co-occurence of pelvic floor disorders in community-dwelling women. Obstet Gynecol. 2008; 111:678-85.

839. Borello-France D, Burgio KL, Richter HE, Zyczynski H, Fitzgerald MP, Whitehead W, Fine P, Nygaard I, Handa VL, Visco AG, Weber AM, Brown MB. Fecal and urinary incontinence in primiparous women. Obstet Gynecol 2006;108:863-72.

840. Erekson EA, Sung VW, Myers DL. Effect of body mass index on the risk of anal incontinence and defecatory dysfunction in women. Am J Obstet Gyencol. 2008;198:596-99.

841. Altman D, Falconer C, Rossner S, Melin I. The risk of anal incontinence in obese women. Int. Urogynecol. J. 2007;18:1283-9.

842. Bharucha AE, Zinsmeister AR, Schleck CD, Melton LJ 3rd. Bowel disturbances are the most important risk factors for late onset fecal incontinence: a population-based case-control study in women. Gastroenterology. 2010 Nov;139(5):1559-66. Epub 2010 Aug 10.

843. Burgio KL, Richter HE, Clements RH, Redden DT, Goode PS. Changes in urinary and fecal incontinence symptoms with weight loss surgery in morbidly obese women. Obstet Gynecol. 2007;110:1034-40.

844. Oberwalder M, Connor J, Wexner SD. Meta-analysis to determine the incidence of obstetric anal sphincter damage. Brit. J Surg. 2003;90:1333-7.

845. Bols EM, Hendriks EJ, Berghmans BC, Baeten CG, Nijhuis JG, de Bie RA. A systematic review of etiological factors for postpartum fecal incontinence. Acta Obstet Gynecol Scand. 2010 Mar;89(3):302-14. Review.

846. Nelson RL. Epidemiology of fecal Incontinence. Gastroenterology.2004;126 (Suppl. 1): s3-7.

847. Goffeng AR, Andersch B, Andersson M, Berndtsson I, Hulten L, Oreslan T. Objective methods cannot predict anal incontinence after primary repair of extensive anal tears. Acta Obstet Gynecol Scand. 1998;77:439-43.

848. Guttierz AB, Madoff RD, Lowry AC, Parker SC,Buie WD, Baxter NN. Long term results of anterior sphincteroplasty. Dis Colon & Rectum. 2004;47:727-32.

849. Halverson AN, Hull TL. Long-term outcome of overlapping anal sphincter repair. Dis Colon & Rectum. 2002;45:345-8

850. Karoui S, Leroi AM, Koning E, Menar JF, Michot F, Dens P. Results of sphincteroplast in 86 patients with anal incontinence. Dis Colon & Rectum. 2000;43:813-20.

851. Malouf AJ, Norton CS, Engel AF, Nicholls RJ, Kamm MA. Long-term resuls of overlapping anterior anal sphincter repair for obstetrical trauma. Lancet. 2000;355:260-5.

852. Pinta T, Kyaanpaa ML, Salmi T, Jaarvinen HJ, Luukkonen P. Delayed sphincter repair for obstetric ruptures: analysis of failure. Colorectal Dis. 2003;5:73-8.

853. Rothbart J, Bemelman WA, Meijerink WJ. Long term results of anterior anal sphincter repair for rectal incontinence due to obstetric injury. Dig. Surg. 2000;17:390-4.

854. Vaizey CJ, Norton C, Thornton MJ, Nicholls RJ, Kamm MA. Long term results of repeat anterior anal sphincter repair. Dis Colon & Rectum.2004;47:858-63.

855. MacArthur C, Glazener CMA, Lancashire R, Herbison P, et al. Faecal incontinence and mode of first and subsequent deliveries: a six year longitudinal study. Br J Obstet Gynecol.2005;112:1075-82.

856. Zetterstrom J, Lopez A, Anzen B, Dolk A, Norman M, Mellgren A. Analincontinence after vaginal delivery: a prospective study in pimiparous women. Obstet Gynecol.1999;106:324-30.

857. Devine JB, Ostergard DR, Noblett KL. Long tern complications of the second stage of labor. Contemp. Obstet Gynecol.1999:119-26.

858. Fynes M, Donnelly VS, O'Connell PR, O'Herlihy C. Cesarean section and anal sphincter injury. Obstet Gynec.1998;92:496-500.

859. Altman D, Zetterestrom J, Lopez A, Pollack J, Nordenstam J, Mellgren A. Effect of hysterectomy on bowel function. Dis. Colon & Rectum 2004;47 :502-9.

860. MacKenzie WR, Hoxie NJ, Proctor ME, Gradus MS, Blair KA, Petersen DE et al. A massive outbreak in Milwaukee of cryptosporidium infection transmitted through the public water supply. N Eng J Med. 1994;331:161-167.

861. Papathanasopoulos AA, Katsanos KH, Tatsioni A, Christodoulou DK, Tsianos EV. Increased fatigability of external anal sphincter in inflammatory bowel disease: significance in fecal urgency and incontinence. J Crohns Colitis. 2010 Nov;4(5):553-60. Epub 2010 Jun 11.

862. Sullivan SN, Wong C. Runner's diarrhea. Different patterns and associated factors. J Clin Gastroenterol. 1992;14:101-104.

863. Vitton V, Baumstarck-Barrau K, Brardjanian S, Caballe I, Bouvier M, Grimaud JC. Impact of high-level sport practice on anal incontinence in a healthy young female population. J Womens Health (Larchmt). 2011 May;20(5):757-63. Epub 2011 Apr 18.

864. Pernikoff BJ, Eisenstat TE, Rubin RJ, Oliver GC, Salvati EP. Reappraisal of partial lateral internal sphincterotomy. Dis Colon Rectum. 1994;37:1291-1295.

865. del Pino A, Nelson RL, Pearl RK, Abcarian H. Island flap anoplasty for treatment of transsphincteric fistula-in-ano. Dis Colon Rectum. 1996;39:224-226.

866. Gorfine SR. Treatment of benign anal disease with topical nitroglycerin. Dis Colon & Rectum. 1995;38:453-457.

867. Johannsson HO, Graf W, Pahlman L. Long term results of hemorrhoidectomy. Eur J Surg.2002;168:485-9.

868. Denost Q, Laurent C, Capdepont M, Zerbib F, Rullier E. Risk factors for fecal incontinence after intersphincteric resection for rectal cancer. Dis Colon Rectum. 2011 Aug;54(8):963-8.

869. Maeda Y, Høyer M, Lundby L, Norton C. Faecal incontinence following radiotherapy for prostate cancer: a systematic review. Radiother Oncol. 2011 Feb;98(2):145-53. Epub 2011 Jan 21.

870. Wald A. Systemic diseases causing disorders of defecation and continence. Sem Gastrointest. Dis. 1995;6:194-202.

871. Bliss DZ, Johnson S, Savik K, Clabots CR, Gerding DN. Fecal incontinence in hospitalized patients who are acutely ill. Nursing Res. 2000;49:101-108.

872. Nakayama H, Jorgensen HS, Pedersen PM, Raaschou HO, Olsen TS. Prevelance and risk factors of incontinence after stroke: The Copenhagen Stroke Study. Stroke. 1997;28:58-62.

873. Porell F, Caro FG, Silva A, Monane M. A longitudinal analysis of nursing home outcomes. Health Svc.s Rsch. 1998;33:835-65.

874. Chassange P, Landrin I, Neveu C, Czernichow M, Doucet J, Denis P, Bercoff E. Fecal incontinence in the institutionalized elderly: incidence, risk factors and prognosis. Am J Med.1999;106:185-190.

875. Nelson RL, Furner SE. Prospective cohort study or risk factors for incontinence in Wisconsin Nursing Homes. Maturitas. 2005 Sep 16;52(1):26-31. Epub 2005 Jan 19.

876. Fornell EU, Wingren G, Kjoelhede P. Factors associated with pelvic floor dysfunction with emphasis on urinary and fecal incontinence and genital prolapse: an epidemiological study. Act. Obstet. Gynecol. Scand. 2004;83:383-389.

877. Lewicky-Gaupp C, Cao DC, Culbertson S. Urinary and anal incontinence in African American teenaged gravidas during prgnancy and in the puerperium. J Ped Adolsc Gynec. 2008;21:21-6.

878. von Brummen HJ, Bruinse HW, van de Pol G, Heintz APM, van der Vaart CH. Defecatory symnptoms during and after the first pregnancy: prevalences and associated factors. Int. Urogynec. J. 2006;17:224-30.

879. Solans-Demenech M, Sanchez E, Espuna-Pons M. Urinary and anal incontinence during pregnancy and the post-partum: incidence, severity and risk factors. Obstet Gynec. 2010;115:618-28.

880. Culligan PJ, Myers JA, Goldberg RP, Blackwell L,Gohmann SF, Abell TD. Elective cesarean section to prevent anal incontinence and brachial plexus injuries associated with macrosomia – a decision analysis. Int Urogyencol J. 2005;16:19-28.

881. Faltin DL, Boulvain M, Floris LA, Irion O. Diagnosis of anal sphincter tears to prevent fecal incontinence; a randomized controlled trial. Obstet & Gynecol. 2005;106:6-13.

882. Hay-Smith J, Mørkved S, Fairbrother KA, Herbison GP. Pelvic floor muscle training for prevention and treatment of urinary and faecal incontinence in antenatal and postnatal women. Cochrane Database Syst Rev. 2008 Oct 8;(4):CD007471. Review.

883. Bø K., Haakstad LA. Is pelvic floor muscle training effective when taught in a general fitness class in pregnancy? A randomised controlled trial. Physiotherapy. 2011 Sep;97(3):190-5. Epub 2011 Feb 4.

884. Shamliyan T, Wyman J, Bliss DZ, Kane RL, Wilt TJ. Prevention of urinary and fecal incontinence in adults. Evid Rep Technol Assess (Full Rep). 2007 Dec;(161):1-379.

885. Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. BJU Int. 2011 Oct;108(7):1132-8. doi: 10.1111/j.1464-410X.2010.09993.x. Epub 2011 Jan 13.

Committee 4

Pathophysiology of Urinary Incontinence, Faecal Incontinence and Pelvic Organ Prolapse

Chair

H. Koelbl (Germany)

Members

Ty. Igawa (Japan),

S. Salvatore (Italy),

R.M. Laterza (Germany),

A. Lowry (Usa),

K-D. Sievert (Germany),

A. Sultan (U.K.)

CONTENTS

Pathophysiology of Urinary Incontinence, Faecal Incontinence and Pelvic Organ Prolapse

H. Koelbl
Ty. Igawa, S. Salvatore, R.M. Laterza,
A. Lowry, K-D Sievert, A. Sultan

PREFACE

For this 5th International Consultation on Incontinence, the Committee on Pathophysiology has considered the causes of pelvic organ prolapse and urinary and faecal incontinence. Knowledge has increased in the recent years about childbirth and pregnancy, leading to urinary and faecal incontinence.

Special problems of the elderly have also been included for this ICI. We have also been 2asked to consider pathophysiological mechanisms underlying pelvic organ prolapse. These three areas (urinary incontinence, pelvic organ prolapse and faecal incontinence) are closely interconnected by virtue of similar location within the body. In the case of women, childbirth and pregnancy may contribute to one or all of these conditions. Yet there are also neurological factors, and gender specific factors which must be considered in the evaluation of any given patient. Thus, we have tried to provide a balanced overview of the subject, keeping in mind both the common and the distinct qualities of the various conditions, while organising them in a logical, narrative manner that make any one section of the chapter easy to read.

In the area of women's stress incontinence, intrinsic urethral function continues to receive increased attention. As newer pharmacological agents to provide neural stimulation of the striated sphincter appear, and the limits of vaginal suspensory operations for correction of urethral dysfunction are reported, considerations of pathophysiology have shifted from the 50 year old paradigm regarding urethral mobility associated with vaginal prolapse in the genesis of incontinence. However, these newer directions should be considered against the background of half a century of observation and practical clinical experience. We therefore continue to recommend a balanced approach.

In the area of men's incontinence, the greatest concern remains the problem of sphincter injury following radical pelvic surgery and brachytherapy. While many thousands of procedures are performed annually, our knowledge about sphincter anatomy and function has progressed little. Instead, empirical methods of treatment and hopefully prevention have been advanced to treat affected individuals, and insofar as prosthetic implants remain an effective method of treatment, enthusiasm for further basic research into male sphincter function remains limited. In contrast to this kind of sphincter injury, the causes of incontinence associated with bladder outlet obstruction and prostatic enlargement have been well characterised, and little new knowledge has appeared in recent years.

A. THE OVERACTIVE BLADDER

I. INTRODUCTION

The International Continence Society defines urgency as "the complaint of a sudden compelling desire to pass urine, which is difficult to defer" [1]. The "overactive bladder" (OAB) is a symptom syndrome which is defined by the presence of urgency, with or without urgency incontinence, but usually with frequency and nocturia in the absence of infection or other obvious pathology [1]. Therefore, urgency is the pivotal symptom of the OAB syndrome. A better understanding of the genesis of urgency and its relationship to other aspects of bladder function is required to unravel the pathophysiology of OAB and to develop more effective treatments [2].

OAB symptoms are suggestive of urodynamically demonstrable detrusor overactivity (DO; involuntary detrusor contractions) during the filling phase which may be spontaneous or provoked [1]. However, OAB is not interchangeable with DO regardless of whether they are associated with reported urgency. Only about half of all patients with DO experience

urgency [3], whereas among patients with urgency 44–69% exhibit DO during cystometric studies [4-7].

The definition of urgency as a complaint implies that it can only be measured in cognitively intact patients [2, 8]. Quantifiable and objective demonstration of urgency is difficult, and thus surrogate measures are often used as outcome measures in OAB, leading to inconsistency between clinical trials. Urgency is a pathological sensation and does not necessarily involve the same mechanisms as those underlying the physiologic desire to void upon bladder filling. Therefore, comparisons between urge in healthy people and urgency in patients may help our understanding of the mechanisms involved in the latter but, in fact, may be misleading [8].

The emphasis on urgency, rather than DO, as the defining element of OAB gives the condition a subjective foundation which renders derivation of basic science insights challenging. The subjective nature of urgency makes development of animal models impossible. Despite these limitations, most studies on mechanisms related to urgency/OAB have employed the use of isolated tissues and experimental animals. Non-voiding contraction remains the most frequently used surrogate parameter in such experimetal animal studies [8]. The pathophysiology of the OAB syndrome and DO is still incompletely known, but most probably multifactorial. Against the background mentioned above, this section focuses on pathophysiology of OAB and reviews studies that have provided insight into the mechanisms underlying OAB symptoms and DO.

DO may be further characterised as neurogenic when there is a relevant neurological condition. The dependence of lower urinary tract (LUT) functions on complex central neural networks makes these functions susceptible to a variety of neurological disorders. Non-neurogenic aetiologies may be related to outflow obstruction, aging and female anatomical incontinence, but most cases are idiopathic. There may be two possible origins of OAB symptoms; 1) decreased capacity to handle the afferent signals in the brain, and 2) abnormally increased afferent signals from the bladder and /or urethra (**Figure 1**).

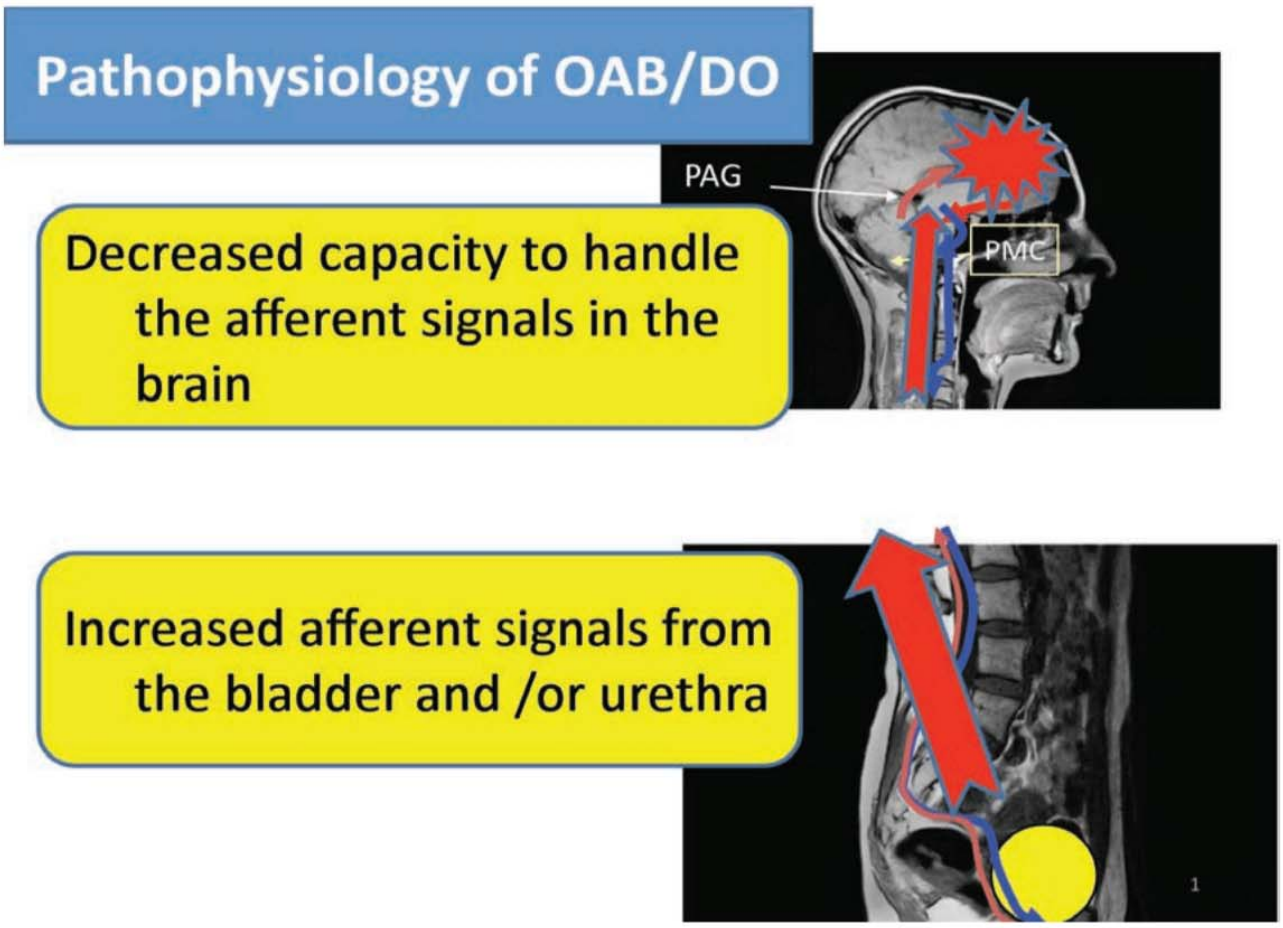


Figure 1. Two possible origins of OAB symptoms; 1) decreased capacity to handle the afferent signals in the brain, and 2) abnormally increased afferent signals from the bladder and /or urethra.

II. MECHANISMS UNDERLYING INCREASED AFFERENT ACTIVITY

Two theories probably contribute in varying proportion to the complex mechanisms underlying the genesis of DO and the associated storage symptoms comprising OAB, have been put forward (**Figure 2**):

- The urothelium-based hypothesis: changes in urothelial receptor function and neurotransmitter release as well as in the sensitivity and coupling of the suburothelial interstitial cell network lead to enhancement of involuntary contractions [9, 10].
- The myogenic hypothesis: changes to the excitability and coupling of smooth muscle cells with other myocytes or interstitial cells lead to the generation of uninhibited contractions [11, 12].

1. THE UROTHELIUM-BASED HYPOTHESIS

There is increasing evidence that urothelial cells play an important role in modulation of bladder activity by responding to local chemical and mechanical stimuli and then sending chemical signals to bladder afferent nerves. It has been shown that urothelial cells express various "sensor molecules" such as receptors of bradykinin, neurotrophins, purines (P2X and P2Y), norepinephrine (NE) (α and β), ACh (nicotinic and muscarinic), epithelial Na + channels (ENaC), and a number of transient receptor potential (TRP) channels. These sensor molecules respond to mechanical as well as chemical stimuli and in turn release chemicals such as ATP, prostaglandins (PG), nerve growth factor (NGF), ACh, and NO. These agents are known to have excitatory or inhibitory actions on afferent nerves, which are located close to or in the urothelium (**Figure 3**) [10].

The urothelium interacts closely with the underlying suburothelial layer, in particular the interstitial cell network contained within it, so that the whole structure can be regarded as a functional unit [9]. The suburothelium is an area composed of nerves, blood vessels, and connective tissue in intimate contact with the urothelium. Recently, the roles of the urothelium and suburothelial myofibroblasts in afferent activation have become the focus of intense interest. The C-fibre afferents generally have endings in the suburothelial layer of the bladder wall, but in some cases, they also penetrate the urothelium [13].

ATP was the first neurotransmitter demonstrated to be released directly from the urothelium [14]. Non-vesicular ATP release is evoked by chemical stimuli or by stretch proportional to the extent of bladder distension [15-19]. Both P2X and P2Y purinergic receptor subtypes have been identified in the bladder urothelium. It is now thought that these may respond to urothelial-derived adenosine triphosphate (ATP) release in autocrine and paracrine signalling [15, 16, 20-23]. By acting on structures such as nerves [24] and interstitial cells in the suburothelial space, it is thought to trigger the underlying afferent signalling bladder fullness and pain and possibly even to activate the micturition reflex [25].

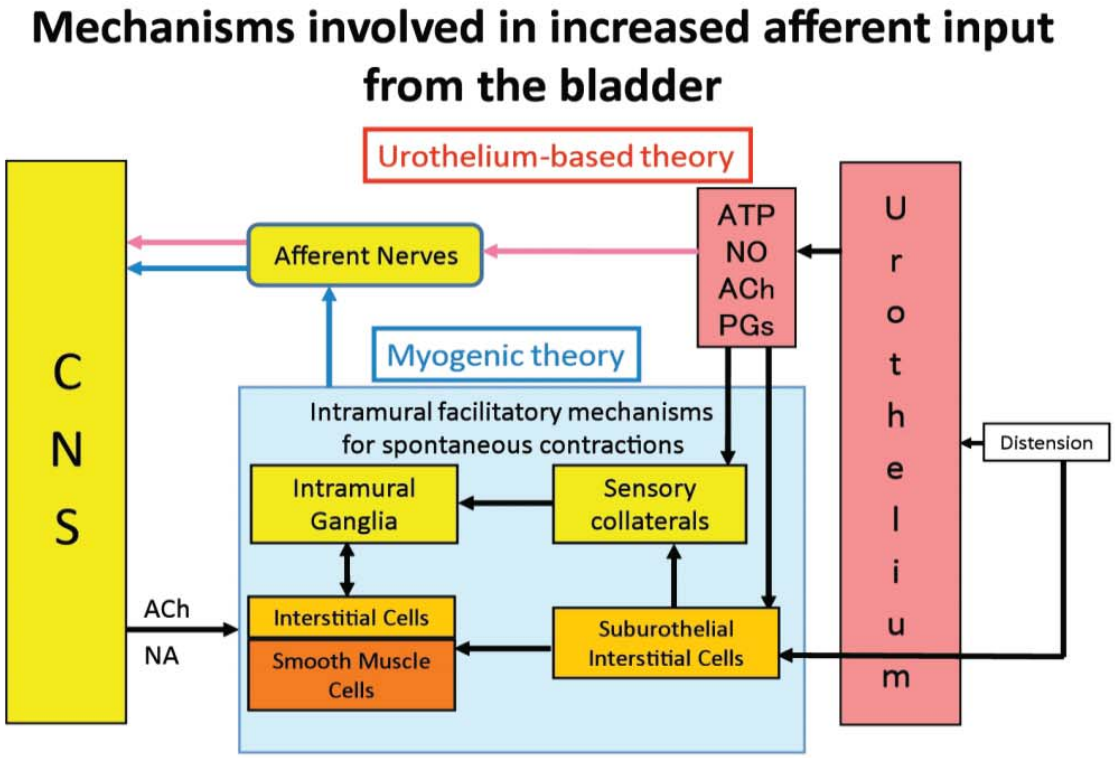


Figure 2. Mechanisms involved in increased afferent input from the bladder: the urothelium-based and myogenic theories

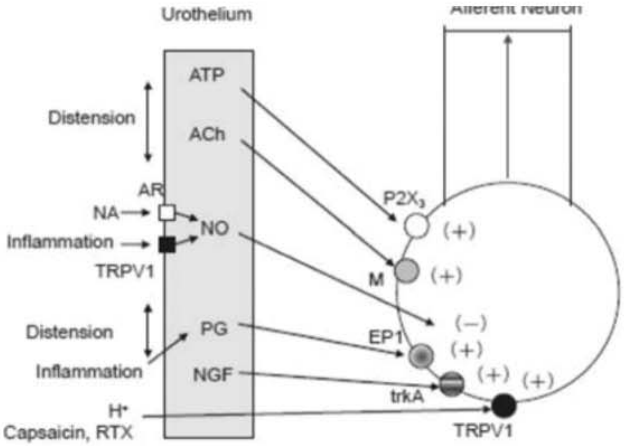


Figure 3. The urothelial afferent transduction system (modified from Yoshida M et al. 2010 [10])

After successful treatment with botulinum toxin injection, a reduced immunoreactivity correlated well with a reduction in urgency [26]. Pathologically increased amounts of urothelially released ATP in rats with spinal cord injury can be reduced on treatment with botulinum toxin [27]. Sugaya et al [28] recently reported that improvement of OAB symptoms with antimuscarinic treatment was significantly correlated with a decrease in urinary ATP level in female patients with OAB.

The presence and localisation of muscarinic receptor protein and mRNA in the human [29-34] and mouse [35] urothelium have been studied. All five muscarinic subtypes are expressed throughout the urothelial layers with a specific localisation of the M2 subtype to the umbrella cells and M1 to the basal layer, with M3 receptors more generally distributed. Release of ACh from human urothelial and suburothelial sites increases with age, as well as during bladder stretch, and represents a functional, non-neuronal, alternative cholinergic system [31]. At therapeutic doses, antimuscarinics act mainly during the filling phase and exert little effect on detrusor contraction during emptying [36-38]. This lends support to the suggestion that urothelial muscarinic receptors might be involved in the generation of afferent impulses.

Urothelial cells express both α and β adrenoceptor subtypes, stimulation of which has been shown to trigger the release of ATP and nitric oxide (NO), respectively [39, 40]. Stimulation of urothelial β adrenoceptors also triggers an urothelially-derived inhibitory factor [41]. Catecholamines could be released from nerves adjacent to the urothelium; however, neither a role for catecholamines nor an altered adrenoceptor profile has yet been shown in pathological conditions.

In addition to the changes in ACh-release mentioned above, several specific alterations in urothelial function and ultrastructure have been demonstrated in OAB. Expression of the mechanosensitive ENaC is increased significantly in human obstructed bladders in comparison to unobstructed controls and correlates significantly with storage symptom scores [42]. It is possible that increased expression of mechanosensitive channels such as ENaC in the urothelium enhances substance release upon bladder stretch. Levels of PG, which is locally synthesised in bladder muscle and mucosa, and levels of NGF are increased in subjects with OAB in comparison to controls; and in symptomatic patients, levels of PGE 2 are positively correlated with voiding behaviour and maximum cystometric capacity [43, 44]. Bladder biopsies from patients with both idiopathic detrusor overactivity (IDO) [45] and neurogenic detrusor overactivity (NDO) [46] have shown increased urothelial TRPV1 expression. This may be in accordance with the fact that intravesical vanilloids (resineferatoxin) have been shown to improve OAB symptoms in patients with idiopathic detrusor overactivity as well as with hypersensitivity disorders [47, 48].

This sensory process is more complex than originally thought. A suburothelial layer of myofibroblasts (interstitial cells) that or a functional syncitium through connexin 43 gap junction can be identified in the bladder wall [49, 50]. These myofibroblasts make close apposition to unmyelinated nerves (afferent C-fibre nerves) [51]. The studies investigating human myofibroblasts show that the cells can respond to ATP by generating an intracellular Ca2+ transient, which is mediated by a P2Y receptor, most likely including a P2Y6 [52]. On the basis of these observations, it has been hypothesised that the close relation between nerves and myofibroblasts allows for an amplification of the afferent system in its response to stimulatory mediators such as ATP.

Overall, up-regulation of urothelial function and increased release of various chemical mediators and known neurotransmitters may influence afferent nerve activity to generate OAB symptoms, although the precise mechanism by which these processes interact with neural tissue to achieve signal transduction remains to be clarified.

2. MYOGENIC HYPOTHESIS

Brading and Turner [11, 12] have emphasised that myogenic changes (regardless of aetiology) may contribute to the pathophysiology of idiopathic detrusor overactivity. On the basis of observation that denervation is consistently found in detrusor biopsy specimens from patients with various forms of non-neurogenic detrusor overactivity, it has been proposed that partial denervation of the detrusor may alter the properties of smooth muscle, leading to increased excitability and increased coupling between cells [53]. Thus, local contraction (activity) that occurs somewhere in the detrusor will spread throughout the bladder wall, resulting in coordinated myogenic contraction of the whole bladder. In addition, this local contraction in the bladder wall has been shown to generate afferent discharge [54, 55]. Recently,

localised bladder activity was assessed by the micromotion detection method, demonstrating that women with increased bladder sensation on filling cystometry had a significantly higher prevalence of localised activity than the control group [56]. This observation suggests that localized distortion of the bladder wall simulates afferent activity, which would precipitate a feeling of urgency and detrusor overactivity [57, 58] (**Figure 4**).

Although the relationships between intercellular communication and spontaneous mechanical activity and the degree of involvement of different types of connexins (Cxs) need further study, Cx45 and Cx43 appear to be the most prominent Cxs expressed in human detrusor smooth muscle tissue and cultured cells. Observations in tissue biopsies from patients with neurogenic DO and urgency symptoms clearly demonstrated an increase in the presence of Cx43-derived gap junction channels in detrusor muscle [59].

In addition, another population of cells in the bladder known as interstitial cells has been proposed for a pacemaking role in spontaneous activity of the bladder [60, 61]. Because it has been reported that the number of interstitial cells is increased in a guinea-pig model of BOO [62] and that c-kit tyrosine kinase inhibitors, which inhibit interstitial cell activity, decreased the amplitude of spontaneous contractions in the guinea-pig and human bladder [63, 64], interstitial cells may also be involved in the emergence of detrusor overactivity because of enhanced autonomous detrusor muscle activity.

3. OTHER LOCAL FACTORS

a) Ischaemia

Ischaemia/reperfusion has been proposed as a pathophysiological factor of OAB/DO. Recent studies suggest that arterial obstructive disease, such as atherosclerosis, may cause OAB in both men and women via ischaemia, hypoxia and oxidative stress in the bladder [65-68]. DO associated mitochondrial stress may have a central role in epithelial damage, smooth muscle cell injury and neurodegeneration. Superoxide dismutase and aldose reductase up-regulation in the overactive bladder imply intrinsic defensive reaction against free radicals that apparently fails to prevent oxidative damage and neurodegeneration [67]. HIF, TGF-β, VEGF and NGF up-regulation in the ischaemic bladder was accompanied by the loss of mitochondrial structural integrity, fibrosis, and the degeneration of microvasculature and nerve fibres [69]. These observations may suggest the role of ischaemia in the overactive bladder with impaired contraction, as reported in elderly patients without obstruction. Ischaemia may be a key factor in aging associated LUTS.

b) Inflammation

Recent studies have noted signs of inflammation in bladder biopsy specimens from OAB patients [69, 70]. Increases in cytokines, chemokines, and growth factors have been reported in the urine of OAB patients [71]. Consistent association of increasing serum CRP levels and OAB has been also demonstrated [72, 73]. All together, these results support the hypothesis for the role of inflammation in the development of OAB.

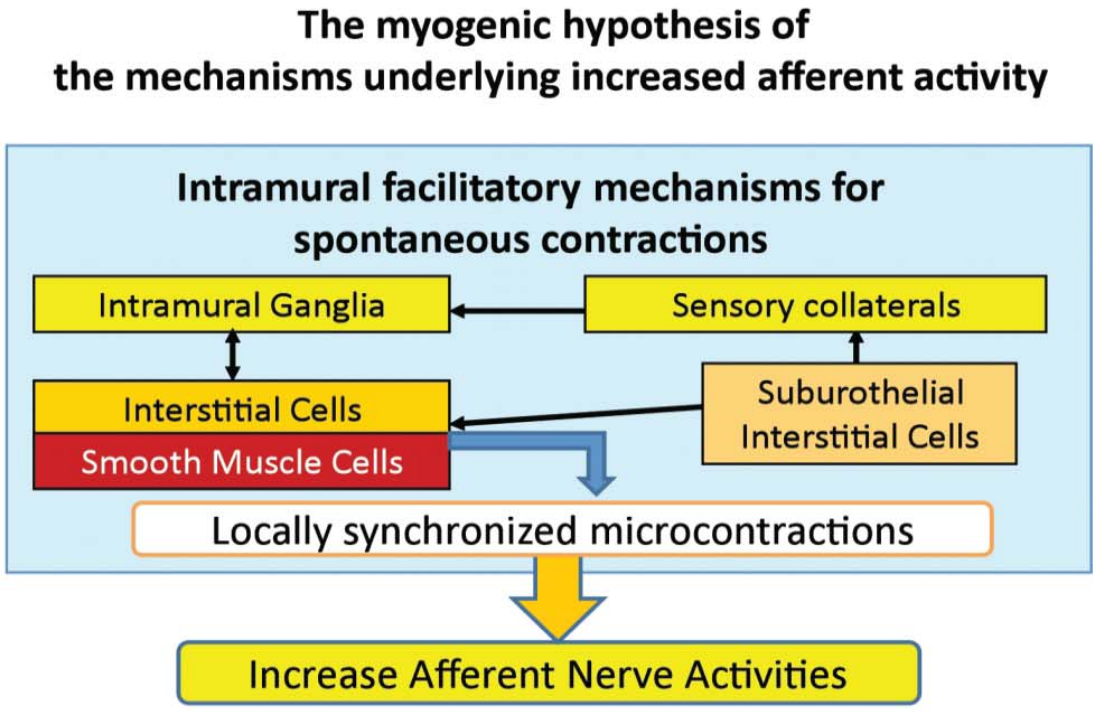


Figure 4. The myogenic hypothesis of the mechanisms involved in increased afferent input from the bladder

III. MECHANISMS INVOLVED IN ABNORMAL HANDLING OF THE AFFERENT SIGNALS IN THE BRAIN

The 'neurogenic hypothesis' suggests that damage to the central inhibitory pathways, or sensitisation of afferent nerves, leads to the unmasking of primitive voiding reflexes which trigger overactive detrusor contraction [74, 75]. Plasticity both in the peripheral innervation and within the CNS may have a pathophysiological role in DO [76], and increased release of nerve growth factor has been reported, which may alter the neural regulation of detrusor muscle [77-79]. Peripherally, neurological diseases might cause a sensitisation of C fibres that are silent under normal circumstances, thereby leading to the emergence of a C-fibre-mediated reflex.

1. NEUROGENIC DETRUSOR OVERACTIVITY

Recent advances in functional brain imaging have made it possible to directly study the supraspinal control system operating during bladder filling. Comparisons between brain response in subjects with normal bladder function and those with OAB may give us a neural correlate of urgency and possible origins of OAB symptoms [80-82].

While many neurological diseases predispose patients to neurogenic detrusor overactivity (NDO), the only populations that have been systematically studied are adults with multiple sclerosis, adults with spinal cord injury (SCI) and children and young adults with myelodysplasia [73]. As a sensation it can be affected by neurological disorders and may, therefore, be perceived differently in patients with neurological lesions.

a) Suprapontine lesions

It is generally accepted that suprapontine lesions such as cerebrovascular disease and Parkinson's disease produce DO. The patient with a suprapontine lesion loses voluntary inhibition of micturition, which corresponds to uninhibited overactive bladder according to a classification by Fall et al. [83, 84] .

Higher brain centres provide an additional level of urinary control, which is responsible for conscious sensation, volition and emotional response. Key higher centres include the prefrontal cortex, insular cortex and anterior cingulate gyrus, and functional brain imaging has shown changes in higher CNS activity in OAB [75, 80, 81]. Although such observations have been made infrequently, they do point to some key areas for consideration. For example, the participation of several brain areas in urinary control may explain why brain diseases and senile cerebral atrophy are risk factors for lower urinary tract dysfunction [75]. Variation in observations between individuals implicates a diversity of processes in the mechanisms that underlie OAB, although these are expressed clinically in the common manifestation of OAB. The increased activity observed in certain regions of the brain in patients with OAB may actually be compensatory, to counteract urgency, rather than being responsible for the symptom [75]. This confounds interpretation of function, and there are many questions that still need to be answered.

Brain transection studies in animals with an intact neuroaxis showed that suprapontine areas generally exert a tonic inhibitory influence on the pontine micturition centre (PMC) [85, 86]. In humans, the cerebral cortex (medial frontal lobes) and the basal ganglia are thought to suppress the micturition reflex. Thus, damage to the brain induces DO by reducing suprapontine inhibition.

1. Stroke (Cerebral infarction)

The mechanism of DO induced by cerebral infarction or Parkinson's disease has been further studied using animal models [87, 88]. In the central nervous system, a glutamatergic pathway is known to play a role in both excitatory and inhibitory regulation of micturition [88-90]. It has been demonstrated that in the rat cerebral infarction model, bladder overactivity is mediated by NMDA glutamatergic and D2 dopaminergic excitatory mechanisms [88], suggesting that cerebral infarction may alter a balance between the facilitatory and inhibitory mechanism that results in up-regulation of an excitatory pathway and down-regulation of a tonic inhibitory pathway.

2. Parkinson's disease

Parkinson's disease (PD) is characterised by the degeneration of dopamine-producing cells in the substantia nigra of the midbrain and Lowy body formation. PD is the most common cause of parkisonnism which is the neurological syndrome bearing the hallmarks, hypokinaesia and postural instability. Urgency occurs in 33-54% of patients with PD. Neurogenic DO was seen in 45-93% of PD patients [91]. The most widely accepted theory of pathophysiology of DO in PD is that basal ganglia inhibits the micturion reflex in the normal situation via D1 receptors, and that cell depretion in the substantia nigra in PD results in loss of D1-mediated inhibition and consequently DO [91, 92]. The absence of dopaminergic tone via D1 receptors may cause a dysfunction in GABA regulation in the periaqueductal gray (PAG) and DO [93]. Kitta et al [94] demonstrated an increased activation in the PAG, supplementary motor area, cerebellar vermis, insula, putamen and thalamus during DO in male patients with PD. Compared with previous results in healthy volunteers the periaqueductal gray, insula, putamen and thalamus were common activation sites responding to bladder filling, while the pons was not activated during DO, suggesting alteration in brain activation sites in response to bladder filling may be related to the pathophysiology of DO in patients with PD.

b) Spinal cord lesions

A spinal cord lesion above the lumbosacral level eliminates voluntary and supraspinal control of micturition,

leading to DO mediated by spinal reflex pathways [85]. Disruption below the level of the pons leads to unsustained and uncoordinated detrusor contractions often associated with uncoordinated sphincter overactivity (detrusor-sphincter dyssynergia, DSD). Impairment or loss of bladder sensation is a typical feature.

Electrophysiological studies of the effect of capsaicin on voiding reflexes have shown that the afferent limb of the micturition reflex in chronic spinal cats, consists of unmyelinated C-fibre afferents, whereas in normal cats it consists of myelinated A-delta afferents [85, 95, 96]. Since C-fibre bladder afferents in the cat do not usually respond to bladder distension [97], a considerable reorganisation of reflex connections takes place in the spinal cord following the interruption of descending pathways from the brain. In humans with spinal cord lesions, NDO is likely to be mediated by capsaicin-sensitive C-fibre afferents. Clinical experience with capsaicin supports the role of these C-fibre afferents in the pathophysiology of NDO. Capsaicin has been used for the treatment of NDO in patients with spinal cord injury or multiple sclerosis. When administered intravesically, capsaicin increases bladder capacity, reduces micturition contraction pressure, decreases autonomic dysreflexia and reduces the frequency of incontinence [98-100]. More recently, resineferatoxin, an ultra-potent analogue of capsaicin, has also been used [101-103].

Increased TRPV1, P2X3 and pan-neuronal marker (PGP9.5) staining in suburothelial nerves and increased TRPV1 staining in the basal layer of the urothelium have been observed in patients with neurogenic bladder due to SCI and multiple sclerosis [26]. Treatment of NDO patients with intravesical capsaicin or resiniferatoxin reduces the density of TRPV1, P2X3 and PGP9.5 immunoreactive nerve fibres and urothelial TRPV1 immunoreactivity in those patients exhibiting symptomatic improvement [104]. Injections into the bladder wall of botulinum neurotoxin type A (BoNT/A), an agent that blocks the release of neurotransmitters from afferent and efferent nerves, and from urothelial cells, also reduces NDO and the density of TRPV1- and P2X3-immunoreactive nerves [105]. These results indicate that an abnormality of the C-fibre afferent innervation contributes to NDO.

Upregulation of TRPA1 protein and mRNA levels, in bladder and in dorsal root ganglion (DRG; L6-S1) has been reported in rats with SCI. Moreover, HC-030031 (TRPA1 antagonist) treatment decreased the number and the amplitude of DO, suggesting that the TRPA1 activation and upregulation seem to exert an important role in DO following SCI [106].

Following SCI changes in the electrophysiological properties of bladder afferent neurons have also been observed consisting in multiple action potentials (tonic firing) in response to long depolarizing current pulses [107]. In addition, A-type K+ channels are suppressed in parallel with an increased expression of TTX-sensitive Na+ currents, thereby increasing excitability of C-fibre bladder afferent neurons[108]. These electrophysiological changes contribute to the emergence of the C-fibre-mediated spinal micturition reflex following SCI.

B. PREGNANCY, CHILDBIRTH AND THE PELVIC FLOOR

Despite the great achievements made in modern obstetric practice in developed countries during the last 100 years, delivery remains the most stressful and dangerous event the female pelvic diaphragm is submitted to during a woman's lifespan.

Reduction in both perinatal and maternal mortality rates in recent decades has allowed us to focus increasingly on maternal morbidity and the long-term sequelae of childbirth. Due to improved investigative techniques available over the past decade, the incidence and mechanisms of obstetric injury to the pelvic floor have come under scrutiny.

However, the controversial debate on whether and how pregnancy and vaginal delivery are responsible for pelvic floor damage is still wide open.

During pregnancy, muscular, connective and nervous pelvic structures are already subjected to anatomical, morphological, functional and hormonal changes. During vaginal delivery, the pelvic floor undergoes an enormous amount of stretching to allow the passage of the newborn through it.

During the pregnancy and just after delivery, the functions sustained by the pelvic floor (urinary and faecal continence, pelvic organ containment and sexual function) often begin to fail. Evident or hidden injuries of the pelvic floor may manifest themselves through symptoms of urinary and faecal incontinence, prolapse or sexual dysfunction, with a considerable impact on quality of life.

If several mechanisms of birth trauma have already been investigated, a lot needs to be understood regarding the role of pregnancy on the pelvic floor.

The growing knowledge of the consequences of childbirth and pregnancy on the pelvic floor, offers the chance to develop prevention and treatment strategies. It is important that contributing obstetric factors are identified and their occurrence minimised, in order to focus efforts on preventable risk factors.

I. DAMAGE TO FUNCTIONS SUSTAINED BY THE PELVIC FLOOR

1. POSTPARTUM URINARY INCONTINENCE

A recent systematic review of 33 studies reported a 33% prevalence of any type postpartum urinary incontinence (UI) in the first 3 months postpartum, with a prevalence of weekly and daily incontinence of 12% and 3% respectively. The prevalence in the

vaginal delivery group (31%) was double that of the caesarean section group (15%). Long-term studies in the first year postpartum showed small changes in prevalence over time [109]. Cesarean section seems to decrease the risk of postpartum UI [110, 111], but its protective effect seems to diminish over time and disappears after multiple deliveries [111, 112].

In a recent cohort study extracted by the national Swedish Medical Birth Registry between 1973 and 1982, two groups were identified: 30,880 women who had their first and all subsequent deliveries by cesarean vs. an age-matched sample of 60,122 women who delivered vaginally only. Stress urinary incontinence (SUI) surgery was observed in 0.4% of the cesarean group and 1.2% of the vaginal group (follow-up time 26.9 years), and the risk of SUI is estimated to be 2.9 times higher after vaginal delivery compared with women after cesarean section. Among women with vaginal deliveries, rates of SUI surgery increased with the number of births, whereas in the cesarean delivery cohort it slightly decreased with a higher number of births. Compared with cesarean delivery, the risk of SUI was more than doubled for vaginal delivery with vacuum extraction and tripled for a vaginal non-instrumental delivery, but this lower risk for a vacuum extraction delivery has been in part explained by an overall lower birth rate in this subset of patients. After vaginal delivery, the incidence rates for SUI surgery steadily increased, reaching a peak close to 3 decades after the first delivery. For cesarean delivery, the incidence of SUI increased more slowly and started to diverge from the curve for vaginal delivery very early during follow-up (**Figure 5 A**) [113].

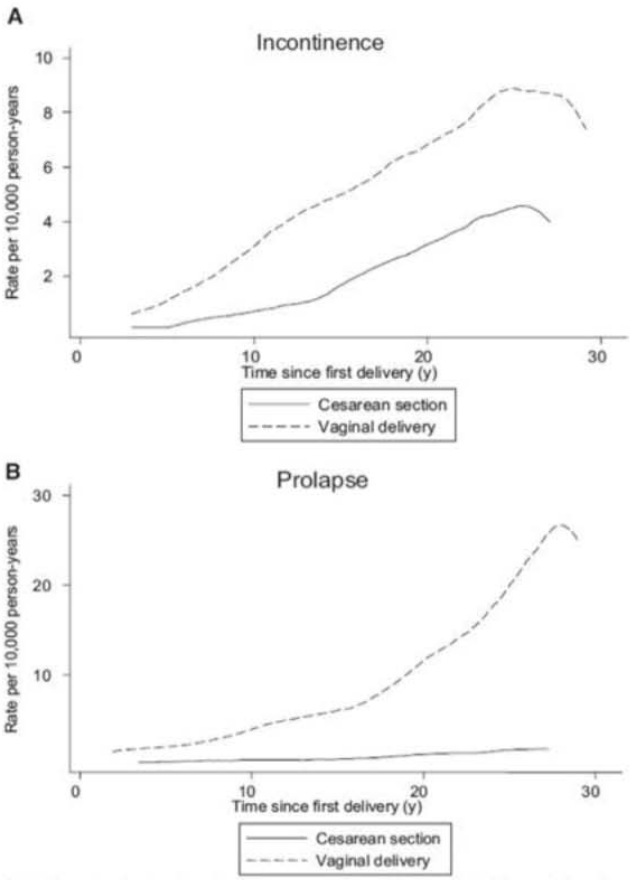
After the first delivery, women who delivered vaginally seem to have at least a two-fold greater risk of urinary incontinence than those who delivered by cesarean. However, data for the rates of incontinence after elective and emergency cesarean section are mixed; therefore meaning that the information as to whether cesarean done before labour confers greater protection than cesarean done after labour is lacking.

To understand the true impact of cesarean delivery on urinary incontinence, future studies must compare incontinence by planned (not actual) delivery modes, consider a woman's entire reproductive career, focus on leakage severe enough to be problematic, consider other bladder symptoms as well as incontinence, and take into account other risk factors, particularly antepartum urinary incontinence [114].

2. ANAL INCONTINENCE

De-novo anal incontinence symptoms after childbirth are reported as up to 26-38% between 6 weeks-6 months postpartum [115-120].

In a population-based survey estimating the postpartum incidence of faecal incontinence, Guise et al. [116] reported that 29% of 8,774 women reported faecal incontinence (defined as recurring episodes of involuntary loss of stool or flatus since delivery) within 3-6 months postpartum: almost half (46%) of them reported incontinence of stool, and 38% reported incontinence of flatus only. Approximately 46% reported the onset of incontinence after the delivery of their first child. Higher body mass index, longer pushing, forceps-assisted delivery, third or fourth-degree tears and smoking were associated with severe faecal incontinence. The authors conclude that in this population-based study, more than one in four women reported faecal incontinence within 6 months of childbirth, with almost half reporting the onset of symptoms after delivery of their first child. Four in ten women reported loss of flatus or stool during intercourse. Given the burden of this condition, both in number and social impact, coupled with the hesitancy of women in initiating this conversation, providers should ask women about symptoms of faecal incontinence during postpartum examinations. Additionally, these data suggest that there may be a benefit to extending postpartum follow-up visits beyond the typical 6-8 weeks to provide surveillance for potential incontinence. LEVEL OF EVIDENCE: II.



A, Incidence rates of stress urinary incontinence surgery in relation to mode of delivery and time since first childbirth; B, Incidence rates of pelvic organ prolapse surgery in relation to mode of delivery and time since first childbirth.

Figure 5 [113] Incidence rates in relation to mode of delivery and time since first childbirth
From: Leijonhufvud et al. Incontinence and prolapse surgery after childbirth. Am J Obstet Gynecol 2011[113]

In comparison to cesarean section, vaginal delivery seems to be associated with an increased risk of anal incontinence. In a population-based study, Guise et al. [115], reported that vaginal delivery has a greater risk of FI compared to cesarean (OR 1.45; 95%CI: 1.29-1.64) 3-6 months postpartum. However, a vaginal delivery without a tear or instrument assistance did not create a higher risk of FI than the risk with cesarean delivery. Being overweight (body mass index >/=30 kg/m(2)), pushing for greater than 2 h, and constipation were independently associated with postpartum FI ($p < 0.05$) regardless of route of delivery.

A self-administered survey of faecal incontinence symptoms and delivery events administered to 50 women at 6 weeks postpartum, showed that vaginal delivery was associated with an increased risk of any faecal incontinence symptom in comparison with cesarean section (43% vs. 20%) [117].

3. PELVIC ORGAN PROLAPSE

The occurrence rate of pelvic organ prolapse stage ≥2 in the first 3-6 months postpartum has been described in literature between 18.1-56% [121-123].

In a cross-sectional study of 382 primigravid women, pelvic organ support was explored 6 months postpartum: POP-Q stage ≥II was present in 7.7, 18.1 and 29.0% of women who delivered by cesarean section, spontaneous and instrumental vaginal delivery, respectively. Spontaneous vaginal delivery increased the risk by more than three times (OR 3.19) while instrumental vaginal delivery increased it more than five-fold (OR 5.52) in comparison with cesarean section. Instrument-assisted delivery did not increase the risk of prolapse in women who delivered vaginally. The authors concluded that cesarean section is associated with a lower prevalence of pelvic organ prolapse after delivery and instrument assisted delivery is not associated with an increased risk of postpartum prolapse among women who delivered vaginally [121].

In the cohort study extracted by the nationwide Swedish Medical Birth Registry [113], POP surgery was recorded in 2.2% of vaginal deliveries and 0.2% of cesarean sections (follow-up time 25.9 years). Among women who had only had vaginal deliveries, rates of POP surgery increased with number of deliveries. In the cesarean delivery cohort, rates of POP surgery slightly decreased with increasing parity. Compared with a cesarean delivery, the risk of POP surgery was increased nine-fold both after non-instrumental vaginal delivery and after vacuum extraction, whereas among women with forceps delivery a twenty-fold increase in risk was observed. The incidence rate of POP in women with cesarean deliveries showed very little variation over time, but started to diverge more notably from the vaginal delivery cohort 10 years after the first birth (**Figure 5B**).

The association between cesarean section and POP was investigated by Larsson et al. [124]: the Swedish Hospital Discharge Registry was used to identify women with an inpatient diagnosis of pelvic organ prolapse, and the data were linked to the Swedish Medical Birth Registry. A total of 1.4 million women were investigated. A strong and statistically significant association between cesarean section and pelvic organ prolapse was found (Adjusted OR 0.18 [95% CI: 0.16-0.20] and overall hazard ratio=0.20 [95% CI: 0.18-0.22]). The authors concluded that cesarean section is associated with a lower risk of pelvic organ prolapse than vaginal delivery.

The incidence rate of urinary incontinence (UI) and anal incontinence during pregnancy in previously continent women has been reported as 39.1% and 10.3% respectively. Age, baseline body mass index, and family history of UI were significantly associated with the occurrence of UI during pregnancy, while age and excess weight gain during pregnancy were associated with the occurrence of anal incontinence during pregnancy. The identified risk factors for both incontinences postpartum were incontinence during pregnancy and vaginal delivery. LEVEL OF EVIDENCE II [125].

About half of all women develop transient urinary incontinence during pregnancy [114]; SUI in pregnancy was a significant predictor for postpartum incontinence. The weight of the women and duration of their labour were also significantly associated with the development of SUI postpartum [126].

Women with incontinence before pregnancy were nearly three times more likely to have postpartum incontinence [127].

Among 272 eligible women attending follow-up at 2 years postpartum, 26 (9.5%) women reported persistent SUI since pregnancy. A higher BMI in pregnant women at term was recognised as an independent risk factor for the persistence of SUI from pregnancy to 2 years post partum [128].

Fear of birth is a frequent cause of cesareans demanded by the patient [129, 130]. A recent cross-sectional study based on the Norwegian Mother and Child Cohort Study (n=58.881), reported that 6% of the sample preferred cesarean over vaginal delivery in week 30 of pregnancy; 16% reported “fear of giving birth” as the reason for cesarean preference [131]. A general fear of pelvic floor trauma was cited as the most common reason for this choice [132]. Despite being based on incomplete prognostic data, this feeling may be echoed increasingly among obstetric patients and may lead to an unselected, and even misguided, increase in cesarean delivery rates.

However, so far, there is no evidence from randomised controlled trials, upon which to base any practice recommendations regarding planned cesarean section for non-medical reasons at term. This has been demonstrated by Lavender et al. [133]: their aim was to find out, from randomised trials, the effects on perinatal and maternal morbidity and

mortality, and on maternal psychological morbidity, of planned cesarean delivery versus planned vaginal birth in women with no clear clinical indication for cesarean section. A search of the Cochrane Pregnancy and Childbirth Group's Trials Register (December 2005), MEDLINE (1974 to April 2005), EMBASE (1974 to April 2005), CINAHL (1982 to April 2005) and PsycINFO (1887 to April 2005) was carried out. The selection criteria were the following: comparisons of intention to perform cesarean section and intention for women to give birth vaginally; random allocation to treatment and control groups; adequate allocation concealment; women at term with a single fetus with cephalic presentation and no clear medical indication for cesarean section. No studies were identified that met the inclusion criteria [133].

To our knowledge, scientific data are insufficient to justify an elective cesarean section in order to avoid pelvic floor symptoms in a woman without previous disorders [134], considering that pregnancy itself may be involved in the development of such problems.

A recent systematic review of Cochrane assessed the ability of cesarean delivery (CD), in comparison to vaginal delivery (VD), to preserve anal continence: 21 reports have been found eligible for inclusion, encompassing 31,698 women having had 6,028 CDs and 25,170 VDs, as the index event prior to anal continence assessment. Only one report randomised women (with breech presentation) to CD or VD, but because of extensive cross-over, 52.1% after randomisation, it was analysed along with the other 20 studies as treated, i.e. as a non-randomized trial. Only one of these reports demonstrated a significant benefit of CD in the preservation of anal continence, a report in which the incidence of incontinence was extremely high, 39% in CD and 48% in VD, questioning, relative to other reports, the timing and nature of continence assessment. The authors did not find any difference in continence preservation in women who had an emergency versus elective CD. They concluded that without demonstrable benefit, preservation of anal continence should not be used as a criterion for choosing elective primary CD [135].

Despite the great advances that have been made in many areas of obstetric care, the effect of pregnancy on the morphology and function of the pelvic floor is still mostly unknown. Prospective data assessing the severity of urinary and anal incontinence during pregnancy are scarce.

II. EFFECT OF PREGNANCY ON PELVIC FLOOR FUNCTION

1. EFFECT ON THE COLLAGEN

During pregnancy, hormones affect the biochemical composition of the solid matrix and hydration phases constituting all pelvic floor tissue. Remodelling mechanisms lead to changes in the organisation, orientation, and diameter of the collagen fibres as well as the crimp structure of the collagen fibrils reinforcing each tissue. Such effects can significantly affect the short and long-term viscoelastic properties of the vaginal wall, the pubovisceral muscles, and the perineal body, for example. They will largely determine (a) the extent and rate at which these structures can be stretched by an expulsive force acting cyclically on the fetal head, and (b) the resistance to stretch provided by those structures. The more a tissue exhibits creep behaviour, the further it will stretch under a constant load. And the more it exhibits relaxation behaviour, the more the stress in a tissue will decrease over time when held at a constant length, thereby helping to lower the risk of rupture in the next loading cycle. Were a tissue to exhibit viscoplasticity, it would behave as a solid below a critical level of stress, but above that level, it would flow like a viscous liquid. There is evidence that tensile failure in some soft tissues can be predicted by the product of the stress times the strain extent in the tissue, so mechanisms that lower one or both these variables will reduce the risk of rupture. Pregnancy is known to significantly affect the instantaneous stiffness and relaxation behaviour of vaginal tissues in rats. However, accurate data are lacking for pregnant human pelvic floor tissues, and the effects of pregnancy on injury at any tissue level, and on structural failure, are as yet largely unknown [136].

Changes in collagen may result in greater mobility of the bladder neck resulting in stress incontinence. In a study of 116 primigravidae, perineal ultrasound was used to assess bladder neck mobility. Women with antenatal bladder neck mobility of more than 5mm on linear movement (equivalent to >108° rotation) were found to be at higher risk of developing postpartum stress incontinence. Approximately 50% of this group reported stress incontinence at 3 months postpartum [137].

There may be a group of women at an inherent increased risk of developing incontinence due to abnormalities in collagen [138], as the collagenous component of the connective tissue contributes to structural support of the bladder neck. In pregnancy, the tensile properties of the connective tissue are reduced, with a reduction in total collagen content and increase in glycosaminoglycans [139].

2. NATURAL HISTORY

Distinguishing the time of onset, severity, and persistence of urinary and anal incontinences during and after pregnancy may provide an insight into the natural history of incontinence, and hence in the differences between transient incontinence due to the hormonal and mechanical effects of pregnancy and the damage that may occur as a result of delivery [125].

Solans-Domenech et al. [125] have brought to light the high incidence of urinary incontinence and anal incontinence over the three trimesters of pregnancy, and particularly in the second trimester. In this cohort study, an incidence rate of urinary incontinence

during pregnancy of 39.1% and 10.3% of anal incontinence was found.

Figure 6 shows the evolution of severity of UI by data collection time, as well as the changes in trends between slight and moderate UI, with a tendency for slight to become moderate UI. The correlation between the severity of UI and level of interference in daily living was moderate but statistically significant in all periods of data collection with correlation coefficients of 0.35, 0.13, 0.46, and 0.47 for the first, second, and third trimesters and postpartum, respectively.

Ten percent of women presented anal incontinence at some point during pregnancy: the evolution of the prevalence of anal incontinence in this study cohort is 2.3%, 6.8% and 7.4% in the first, second and third trimesters. The presence of anal incontinence was characterised by loss of flatus in more than 90% of cases and common to all periods LEVEL OF EVIDENCE: II [125].

The prevalence of urinary and anal incontinence in a subgroup African American of pregnant adolescents (age: 14-19 years) in the third trimester, resulted even higher: 44% of patients complained of urinary urgency incontinence and 43% of stress incontinence; 12% complained of faecal and 41% of flatal incontinence [140].

Incontinence during pregnancy has been linked to age [141], body mass index [142], strenuous physical exercise [143] and smoking history [142].

The risk of UI increases in pregnant women aged more than 35 years, in women who are overweight or obese at baseline, and in those with a family history of UI, while the risk of anal incontinence rises with age and excessive weight gain during pregnancy [125]. Weight gain greater than the 50th percentile during weeks 0–15 of pregnancy was weakly associated with a higher incidence of UI at week 30 compared with weight gain less than or equal to the 50th percentile [144].

The recent data regarding the relationship between urinary incontinence during pregnancy and its persistence or worsening condition postpartum are controversial: the results of Solans-Domenech et al. [125] showed that the occurrence of UI and anal incontinence during pregnancy is related to the presence of incontinence in the postpartum period, and vaginal delivery increases the risk of persistent incontinence. On the other hand Wesnes et al [145] conclude that the association between incontinence postpartum and mode of delivery is not substantially influenced by incontinence status in pregnancy and the prediction of a group with high risk of incontinence according to mode of delivery cannot be based on continence status in pregnancy.

3. FAMILIAL PREDISPOSITION

A familial predisposition in the evaluation of the aetiology of urinary incontinence has also been considered, but the results are still controversial. Buchsbaum et al. [146] investigated the role of vaginal delivery and familial factors in the development of urinary incontinence by comparing the prevalence of this condition in nulliparous women and their parous sisters. Among this sample of biological sisters, urinary incontinence was reported by 47.6% of nulliparous women and by 49.7% of parous women (P =0.782). Considering the high concordance in continence status between sister pairs, and considering that the majority of parous women are continent, an underlying familial predisposition toward the development of urinary incontinence may be present. LEVEL OF EVIDENCE II-2.

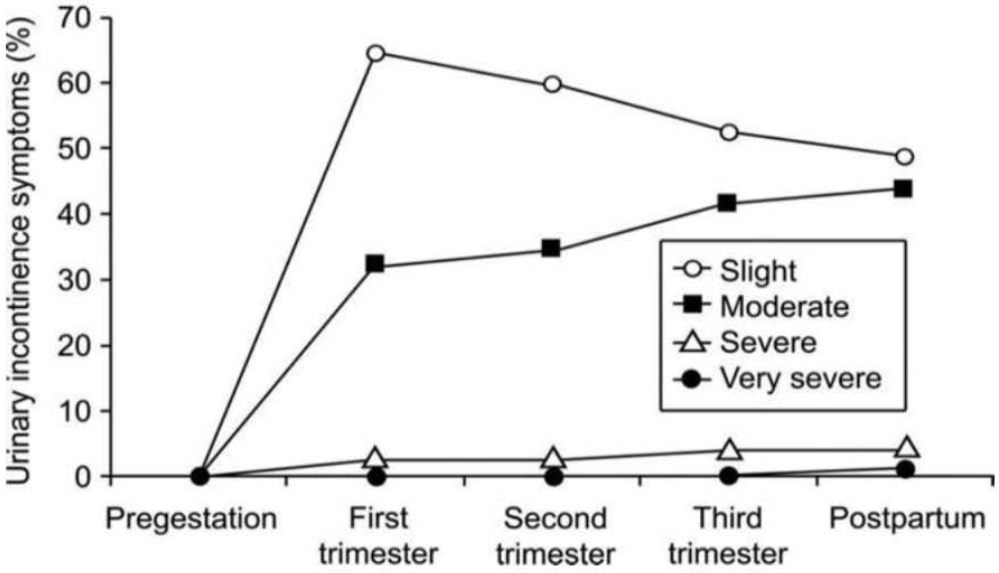


Figure 6. Evolution of the severity of urinary incontinence symptoms by time of data collection. From: Solans-Domenech. Incontinence During Pregnancy and Postpartum. Obstet Gynecol 2010 [125].

A recent article of Nguyen et al. [147], analysed a large population comprising 1530 identical and 234 non-identical female twins (mean age 41.3 years), who answered a specific questionnaire focusing on symptoms of SUI. The two groups were comparable in terms of age, race, parity, BMI, menopausal status, tobacco use, mode of delivery and prior pelvic surgery. The authors demonstrated that environmental factors contributed significantly to the occurrence of SUI (shared environmental factors contribute 77.6% of the variance, unique environmental factors contribute to 20.9% of the variance; p<0.001). The heritability of SUI was not statistically significant for the contribution of the phenotypic variance (1.49%; p=0.46). Additional analyses were performed on the subgroup of women without prior incontinence or prolapse surgery (638 twin pairs) and in the subgroup of twins with "pure stress urinary incontinence" (458 twin pairs): the results in this cohort of patients showed no genetic influence. The authors underscore that environmental factors (in particular obstetric events) play a dominant role in middle-aged women; genetics contributed more toward the development of stress urinary incontinence in elderly women, as reported by Rohr et al. [148]: "nurture" before menopause and "nature" during aging. LEVEL OF EVIDENCE II.

III. PATHOPHYSIOLOGICAL MECHANISM OF BIRTH INJURY TO THE PELVIC FLOOR

Strong epidemiological evidence links vaginal childbirth and the development of postpartum incontinence and prolapse.

There would seem to exist three major mechanisms by which vaginal delivery might contribute to the pelvic floor trauma: a) muscle trauma, b) connective tissue damage, c) nerve injury, d) vascular damage.

1. MUSCLE TRAUMA

The effect of delivery on muscular structure has been widely investigated, either with computer models, MRI and ultrasound. In a three-dimensional computer model Lien et al. [149] predicted levator ani muscle stretch during vaginal birth. Serial magnetic resonance images from a healthy nulliparous 34-year-old woman, and engineering graphics software, were used to construct a structural model of the levator ani muscles along with related passive tissues. The model was used to quantify pelvic floor muscle stretch induced during the second stage of labour as a model in which the fetal head progressively engaged and then stretched the iliococcygeus, pubococcygeus and puborectalis muscles. The largest tissue strain reached a stretch ratio (tissue length under stretch/ original tissue length) of 3.26 in the medial pubococcygeus muscle, the shortest, most medial and ventral levator ani muscle. Regions of the ileococcygeus, pubococcygeus, and puborectalis muscles reached a maximal stretch ratio of 2.73, 2.50, and 2.28, respectively. Tissue stretch ratios were proportional to fetal head size: for example, increasing fetal head diameter by 9% increased medial pubococcygeus stretch by the same amount. The authors demonstrated that the medial pubococcygeus muscles undergo the largest stretch of any levator ani muscles during vaginal birth and it is therefore at the greatest risk of stretch-related injury [149] (**Figure 7**).

Svabik et al. [150] showed that the area of the levator hiatus needs a distension of between 25% and 245% to allow the passage of the fetal head, considering as average a cross-sectional fetal head area of 68 cm2, based on Caucasian biometric data.

The occurrence rate of postpartum levator avulsion in primiparae, diagnosed with 3D-4D ultrasound between 24 hours and 9 months after vaginal delivery, is reported between 15-39.5% [151-157]. The incidence of levator trauma evaluated with MRI is reported between 17.7%-19.1% 6-12 months postpartum [158-161].

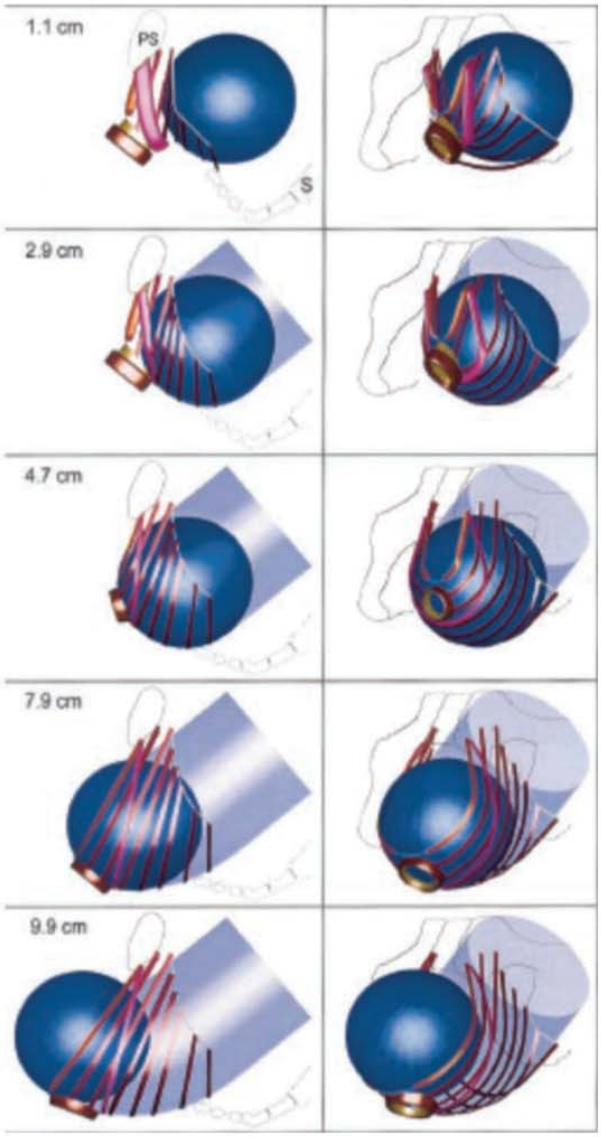


Figure 7. Simulated effect of fetal head descent on the levator ani muscles in the second stage of labour. From Lien et al, Obstet Gynecol 2004 [149].