HABITS AND BEHAVIORS ASSOCIATED WITH

URINARY TRACT INFECTIONS IN YOUNG WOMEN

by

Robin Meeuwsen Conner, R.N., B.S.N.

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APPROVED:

Carol S. Burckhardt, R.N., Ph.D., Associate Professor
        Thesis Advisor

Wilma E. Peterson, R.N., Ph.D., Associate Professor
        First Reader

Dee J. Fuzier, R.N., Ph.D., Associate Professor
        Second Reader

Carol A. Lindeman, R.N., Ph.D., Dean, Oregon Health
        Sciences University School of Nursing

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CHAPTER I

INTRODUCTION

Urinary tract infections (UTIs) occur frequently in young women. These infections cause pain and discomfort, and may lead to serious renal dysfunction. The goal of nursing care is to maximize the self-care abilities of the individual (Orem, 1980). Since health teaching is recognized as a nursing role, nurses are responsible for teaching self-care activities which may prevent a UTI from occurring or those which reduce symptoms and promote comfort.

Urinary tract infection (UTI) is defined as microbial colonization of the urine and infection of the urinary tract structures (Kunin, 1987). Each year, 3% of women in the United States seek treatment for UTI (Vital and Health Statistics, 1982). The incidence of bacteriuria is 1% in females up to ten years of age and rises by 1% per decade throughout life. The incidence of bacteriuria in a similar male population is 0.5%, a statistic which remains constant throughout life (Kass, Miall, Stuart & Rosner, 1975). In a study of 5835 health insurance beneficiaries ages 14-61, (Zielske, 1981) found that 43% of all the women surveyed reported a past history of at least one UTI. Of the women ages eighteen to twenty-four, 37.8% reported a past history of UTI.

Forty to fifty percent of women over the age of 24 reported a past history of UTI.

Symptomatic urinary tract infections are characterized by dysuria, urgency, frequent urination, foul-smelling cloudy urine and hematuria. Enterobacteriacea are the causative organism in 70-80% of recurrent bacteriuria in the female. Escherischea coli (E. Coli) accounts for 80% of these infections, followed by Klebsiella, Proteus, and Enterobacter. Pseudomonas, Staphylococcus, and Group B Streptococcus are found in 5-10% of recurrent infections (Kunin, 1979).

UTIs are problematic for women in terms of discomfort, cost, and potential renal damage. In the Zielske study, of the women with a past history of UTI, 40% experienced pain with the UTI, 31% reported worrying, 21% noted activity restrictions, and 14% reported that they spent days in bed because of the UTI. If a UTI is not treated, the entire urinary tract is at risk for microbial invasion. Pyelonephritis (infection of the kidney) is the cause of chronic renal failure in 4 % of individuals requiring renal transplantation or dialysis (Cook & Takiff, 1986). Traditionally, UTIs in the young female individual have tended to be regarded as minor complaints rather than being recognized as potentially serious due to the complications that may result.

Review of the literature reveals factors which have

been implicated as related to UTI. However, the strength and direction of the association between these factors and UTI is unclear. Description of factors associated with the occurrence of urinary tract infections may lead to identification of nursing interventions that could prevent urinary tract infections or reduce symptoms in young women.

Review of the Literature

The literature review is organized around the factors which have been cited by investigators to be responsible for urinary tract infections in young women. A computerized literature search yielded few studies which examined the impact of habits and behaviors on the occurrence of UTIs in young women. No studies were reported in the nursing literature.

One study was located which examined many of the physiological, pathophysiological, and behavioral factors thought to be associated with UTI. Foxman and Frerichs (1985b) were concerned about the functional and treatment costs of UTI to young women and sought to determine and examine risk factors for UTI. They gathered data from 225 female college students who presented themselves to the student health services. The subjects completed a self-administered questionnaire which asked for

information regarding diet, urination habits, clothing, sexual practices, and birth control methods. Their subjects were asked to answer the questions based on their behavior during the preceding four weeks. A urine culture was obtained, and the subjects were questioned about the presence of symptoms suggestive of UTI such as painful urination, frequent urination, nocturia, urgent need to urinate, or blood in the urine. For the purposes of their study, Foxman and Frerichs defined a UTI as 50,000 colonies of a single bacteria per milliliter of urine and one or more of the above symptoms. A primary case (25 women) was identified as a woman with a positive culture and symptoms, but no prior UTI; a secondary case (19 women) was a woman with a positive culture and symptoms with one prior UTI. Cases with more than one prior UTI were excluded from the study. No rationale was given for this exclusion. Subjects with no history of UTI or symptoms (181 women) served as a comparison group for the primary cases, while the primary cases served as the comparison group for the secondary cases. Study participants ranged in age from 16-39 with a mean age of 21.5 years. No women with diabetes, vaginitis, or candidiasis were enrolled. No subjects were pregnant; none had been hospitalized or catheterized in the four weeks prior to the study. Using summary risk ratios to estimate the relative risk for potential risk factors and

UTI, Foxman and Frerichs found that the use of tampons and intake of soft drinks were moderately associated with both primary and recurrent UTI. Subjects who fell into the category of "primary case" had a higher incidence of using sanitary napkins for menstrual protection, using deodorant soap, using bubble bath, wearing panty hose, urinating soon after intercourse, and of drinking orange juice, ethanol, tea, cola, coffee, and milk. Analysis of the data showed that the secondary cases had a higher incidence of drinking cranberry juice, soft drinks, and citrus juices, eating a vegetarian diet and a variety of spices, taking Vitamin C, using tampons, douches and spermatocides, wearing cotton undergarments, synthetic undergarments and jeans, urinating more than or less than 5-6 times per day, delaying urination, and urinating before sexual intercourse. These results are unclear and are contradictory. Foxman and Frerichs imply that the behaviors exhibited by the secondary cases are associated with UTI. The investigators reported that the secondary cases had a higher incidence of urinating more than or less than 5-6 times per day. They imply that urinating exactly five or six times per day is not associated with UTI. These conclusions are questioned because of the limitations of their study. A major limitation of Foxman and Frerich's study is the fact that the questionnaire focusesed on only the habits and behaviors which occurred

in the four weeks immediately preceding the current
infection. It is not reported how the behaviors
immediately preceding a UTI differ from behaviors
occuring at other times. In addition, although the
primary and secondary cases were experiencing a UTI at
the time the questionnaire was completed, it is
impossible to tell from the results which of the
behaviors contributed to the development of the UTI, or
in the case of the secondary cases, which were behaviors
that the subjects changed in response to their first UTI.
For example, the secondary cases had a higher incidence
of intake of cranberry juice than the primary group. It
is possible that at the time of the subject's first UTI
she was told to drink cranberry juice to prevent further
UTIs. That the secondary group had a higher incidence of
cranberry juice intake may mean the subjects drank
cranberry juice to prevent or treat UTI, not that the
cranberry juice was a cause of the infection. The
secondary cases had a higher incidence of wearing both
cotton underwear and synthetic underwear in the four
weeks preceding the study. One hundred percent of these
women reported wearing all cotton underwear sometime
within the past four weeks and 38 percent reported
wearing all synthetic underwear. The majority of all
three groups wore all cotton underwear. A higher
percentage of secondary cases wore all cotton underwear

sometime during the four weeks prior to the study, but it is unclear what percentage of the time each type of underwear was worn. That 100% of the secondary cases wore cotton underwear may be a reflection of the education women who experienced a past UTI may receive, and not a contributing factor to the development of UTI.

Foxman and Frerichs did not question their subjects regarding perineal hygiene, amount of fluid intake, urogenital procedures which involve instrumentation of the urinary tract, age at onset of sexual activity, age at first UTI, relationship between sexual intercourse and onset of UTI, relationship between UTI and menstrual cycle, and conditions which may interfere with bladder emptying. All of these factors have been implicated in other studies which focussed on the effect of only one habit or behavior associated with UTI. For the purposes of this review, these habits or behaviors have been grouped into physiological factors, pathophysiological factors, and behavioral factors. The factors in these categories may overlap and may interact with other factors, but this division will provide a framework for presentation of the reports. The findings which are pertinent to each of these categories follow.

Physiological factors

Physiological factors include factors unique to normal body functions of the healthy female. A

physiological factor which has been studied in epidemiological studies is age. To determine the prevalence of bacteriuria in women Evans et al. (1978) examined the urine of 8,352 women ages 16-69. These women comprised 81% of the female population of a predominately Caucasian urban community. The overall prevalence of bacteriuria (defined as three consecutive positive urine cultures) was 3.5%. The prevalence of bacteriuria in the 16-19 year age group was 1%. The prevalence increased linearly by one percent per decade to a prevalence of 6% in the 60-69 year old age group.

Takahashi and Loveland (1974) studied 12,076 women who were seeking routine health care evaluations to determine the prevalence of bacteriuria. They defined a UTI as two consecutive clean catch urine specimens with at least 100,000 colonies of a single organism per milliliter of urine. Because a secondary aim of this study was to determine whether oral contraceptives were associated with UTI, pregnant and postpartum women were excluded from this sample. The researchers reported no distinct relationship between age and the prevalence of UTI. The prevalence ranged between 1.5 and 2.5% for the entire sample. Of those subjects under the age of 35, women ages 20-24 had the highest prevalence (2.1%). The subjects over 40 years of age had a prevalence of 2.1-2.5%. The association between age and incidence of UTI

is unclear from these two reports. This lack of clarity may result from the different definitions of UTI used in the two studies.

Other investigators have reported that the increased incidence of UTI in women may be attributed to the short female urethra (Bran, Levison & Kaye, 1972; O'Grady, 1976; Sobel, 1985). The average length of the female urethra is 4 cm in contrast to the male urethra which is 20 cm in length (Crouch, 1978). The female urethra is frequently contaminated with bacteria because of the proximity of the urethral meatus to the vaginal and perianal areas. Small numbers of bacteria entering the bladder is a common event due to the short urethra (Bran et al., 1972) but entry of bacteria into the bladder does not always result in UTI because multiplication of bacteria is largely inhibited by urine flow in the normal urethra (Sobel, 1985).

Another physiological factor associated with UTI is hormonal and pH fluctuations throughout the lifespan and during pregnancy. The pH of both urine and vaginal secretions has been shown to be associated with UTI. Asscher, Sussman, Waters, Davis, and Chick (1966) noted that the average pH of urine obtained from 178 female volunteers was 5.71 while the average pH of urine obtained from 200 male volunteers was 5.59. This difference was statistically significant. The optimum pH

for E. Coli growth was 6.0 to 7.0. Parsons (1985) found that the average pH of vaginal secretions in the premenopausal female was 4.0; that of the postmenopausal woman is approximately 7. These changes over the lifespan are attributed to varying amounts of endogenous estrogens. This acidity is prohibitive to E. Coli growth, but promotes the growth of Lactobacillus. Lactobacillus inhibits the growth of uropathogenic organisms. In the Asscher study described earlier, it was reported that the pH of urine during pregnancy increases and almost invariably supports the growth of E. Coli.

Physiological changes occur during pregnancy which make the pregnant woman more susceptible to UTI. These changes include ureteral dilatation with urine stasis, a reduction in bladder tone, and an increased residual urine volume. The mechanical effects of the enlarged uterus or the increased amounts of circulating estrogens and progesterone may combine to contribute to the development of UTI in the pregnant woman (Huffman, 1962; Lenke & Stamm, 1986). Other studies have found an increased incidence of UTI with increased parity (Williams, Reeves, Condie, & Brumfitt, 1975) however, the investigators noted that the parity also increases with age and that age, rather than parity, may be the cause of the increased incidence of UTI.

In summary, there are factors associated with normal functioning of the healthy female which may contribute to the development of UTI in women. However, since not all women develop UTIs, there must be other factors which account for the development of UTI in some women. These factors may include disease processes or alterations in normal physiological function or behaviors which some women practice.

Pathophysiological factors

Pathophysiological factors include elements pertaining to altered physiological function. These factors may contribute to UTI by reducing resistance to infection or by interfering with normal physiological defense mechanisms. Patients with diabetes mellitus are more prone to many types of infection, including UTI, and once established, UTIs are more frequently complicated. Common complications in this population include emphysematous pyelonephritis, emphysematous cystitis, papillary necrosis, perinephric abscess and metastatic infection (Wheat, 1980). Glucose in the urine serves as a nutrient source for bacteria (Gorke, 1980) and fungus (Wheat, 1980.) The glucose in the urine remains on the perineum after the subject voids and may serve as a nutrient source for organisms present on the perineum. High concentrations of urinary glucose may also impair polymorphonuclear leukocyte phagocyte function (Chernew &

Braude, 1962.)

Asscher et al. (1966) noted a reduction in the ability of the urine to support growth of E. Coli at a high urine osmolarity, but the osmolarity of the urine was increased by the addition of urea, sodium chloride, sodium sulfate, potassium chloride and potassium sulfate, not glucose. Diabetes mellitus, as well as many neurologic diseases, is often accompanied by neurogenic bladder paralysis resulting in incomplete bladder emptying with urination (Ellenberg, 1980). The amount of urine remaining in the bladder after voiding is a factor in the occurrence of UTI. Shand (1970), in a study of 76 non-pregnant women seeking medical care for urinary frequency, found that the usual residual urine volume (RUV) in women without a history of recurrent UTI was less than one milliliter. Ninety two percent of women with a recurrent UTI that was difficult to eradicate had an RUV of greater than one milliliter, usually 50-100 milliliters. The residual urine remaining in the bladder between voiding episodes led to increased bacteria in the bladder urine which multiplied and became more concentrated, allowing a significant infection to develop and be maintained. The ages of the two groups in this study differ. The mean age of the women without a history of UTI was 29.5 years, whereas the women with a history of recurrent UTI was 47.5 years. It was not

reported whether the RUV increases with age independently of urologic history, or if past or current UTI could interfere with bladder emptying. Several studies were found that focussed on the colonization of microorganisms on the perineum as a contributing factor in the development of UTI. Urinary tract infections are believed to be most often caused by bacteria ascending to the bladder from the introitus or rectum. The organisms migrate from the bowel, across the perineum to the urethra, ascend into the bladder and multiply in the urine (O'Grady, 1976).

Regardless of past history of UTI, the presence and distribution of fecal organisms is the same in all women (Stamey, 1973) and similar types of organisms should be present on the perineum of all women. The perineal flora consists of staphylococcus, lactobacillus, corynebacterium, bacteroides, and streptococcus. The presence of E. coli or other enteric organisms on the perineum may be of either a permanent or transient nature. Enteric bacteria present transiently on the perineum may be caused by contamination of the perineum with fecal material after a bowel movement. Colonization of the perineum implies a more permanent presence of the organisms. Women colonized with bacteria have a continuous supply of that organism to the urethra and bladder.

Colonization of the perineum, introitus, and urethra by enteric bacteria was recognized in several classic studies to be an important factor in the occurrence of UTI. Elkins and Cox (1974) obtained perineal, vaginal, and periurethral cultures from 75 women between the ages of 18-21. Forty of these women reported no history of UTI, 20 reported at least one UTI, and 15 reported a prior vaginal infection. Elkins and Cox found that women with a history of UTI had a significantly higher incidence of perineal, vaginal and periurethral colonization with E. coli as compared to subjects without a history of UTI. No statistical analysis was reported in the article. The authors reported that there was no difference in the presence or extent of colonization when women with recent UTIs were compared to those with UTIs in the distant past. There was no difference between groups in frequency of sexual intercourse, type of contraception, or perineal hygiene. Because these cultures were obtained at only one time, it is not known whether the presence of these organisms was permanent or transient. Stamey (1973) followed 16 women with recurrent UTI through a total of 37 episodes of UTI. In 25 of the 37 infections, the organism responsible for the UTI was cultured from the perineum before the UTI developed. Stamey concluded that perineal colonization often precedes the occurrence of UTI. Fair, Timothy,

Millar, and Stamey (1970) studied 30 premenopausal women without a prior history of UTI to determine whether these women were colonized with uropathogenic organisms. Twenty-seven of the thirty women had no uropathogens on the introitus.

Cox (1966) attempted to determine the urethral carriage of organisms in young women who were not experiencing symptoms of a urinary tract infection and who had negative urine cultures. The urethral cultures were obtained by using an instrument developed to simultaneously culture four portions of the urethra without contaminating the specimens during insertion or removal from the urethra. Uropathogenic organisms were found in 25% of the women even though the organisms were not cultured from the bladder urine. It was not reported whether these women had previously experienced a UTI, nor was the age of the subjects reported.

Cox, Lacy, and Hinman (1968) examined urethral carriage of uropathogens in women with recurrent UTI in order to describe the urethral flora of these women. Urethral cultures were obtained from 43 women with recurrent UTIs and urologic abnormalities at a time when they were not experiencing a UTI. The urethral cultures were obtained through use of the same instrument used in the Cox (1966) study described earlier. The types of urological abnormalities are not described in their

report. Fifty four percent of women with recurrent UTI had uropathogenic organisms in the urethra. Although the instrument used in both studies was designed to collect specimens without contamination, it is not known whether the insertion of this device may have introduced organisms into the urethra and affected the results. Because these women had uropathogenic organisms in the urethra but did not have infected bladder urine, Cox and Hinman concluded that host susceptibility to infection was more important in the development of UTI than presence or absence of bacteria.

In summary, women with a prior history of UTI have a higher incidence of perineal and urethral colonization with uropathogenic microorganisms than women without a prior history of UTI. However, women without UTI do carry uropathogenic organisms. It has been concluded by some investigators that it is not the presence of absence of organisms but rather other factors such as host susceptibility which leads to the development of UTI. In an application of these findings, nursing textbooks (Schober, 1986; Innes, 1979) and material written for the lay public (Cooke & Dworkin, 1979; Kilmartin, 1980) recommend that women cleanse the perineum in a "front-to-back" manner after urinating or stooling. The rationale for this practice is to avoid contamination of the perineum with fecal organisms. No studies were found

which examined whether this recommendation was effective.

Urinary tract infections may also occur if organisms are mechanically introduced into the urinary tract. Contamination of the urinary tract organisms can occur with instrumentation of the urinary tract. Mustafa and Pinkerton (1968) found significant bacteriuria in 37% of 253 women who had undergone major gynecological surgery. It is not reported what percentage of these women were catheterized either during the procedure or postoperatively. This population included women who had either abdominal or vaginal operations, including abdominal or vaginal hysterectomy, vaginal reconstruction, and repair of rectovaginal fistula.

Indwelling urinary catheters have been associated with the development of UTIs. Cleland, Cox, Berggren and MacInnis (1971) noted an infection rate of 53.3% in hospitalized patients with indwelling urinary catheters. All subjects were abacteriuric at the time of catheter insertion. The incidence of bacteriuria increased with the length of time the catheter was in place. Twenty-six percent were bacteriuric at two days after insertion, 75% by 4 days, and 92.8% at 8 days. Bacteriuria is less prevalent (1-5%) in subjects who undergo intermittent catheterization where the catheter is inserted to drain the urine and removed immediately (Stamm, 1975).

In summary, there are factors which pertain to

altered physiological functioning which may predispose
some women to UTI. Not all women who have experienced a
UTI have diabetes or have had instrumentation of the
urogenital tract. Women who have experienced UTI may
have a higher incidence of factors such as perineal
colonization with uropathogenic organism and residual
urine volume, but these variables are not easily measured
clinically and it is unknown whether the instrumentation
used to measure these variables may have affected the
results of the studies.

Behavioral factors

Behavioral factors include factors pertaining to
behaviors or habits of an individual. The association
between behavioral factors and UTI has been reported
anecdotally in the literature and nursing interventions
have been based on anecdotal reports.

One behavioral factor which is found extensively in
the literature is the relationship between sexual
activity and UTI. The supposed mechanism is that trauma
to the female urethra during intercourse makes the
urethral mucosa more susceptible to colonization with
bacteria from the introitus. Obviously, not all women
develop a symptomatic UTI after every intercourse so
there must be other factors in addition to trauma to the
urethra which result in UTI.

In order to determine whether women developed

bacteriuria after intercourse Buckley, McGuckin, and MacGregor (1978) collected urine samples from 20 sexually active couples. The women participating in this study were 21-40 years of age. Three had never had a urinary tract infection, fourteen had experienced no more than two UTIs, and three had a history of four or more infections. None of the women had a UTI at the time of the study or in the six months prior to the study. Urine samples were collected within four hours before intercourse and again one hour, eight to ten hours, and thirty to forty hours after intercourse. A total of 304 urine samples were collected in 76 episodes of sexual intercourse. In 23 of the episodes, the bacterial colony counts after intercourse were increased by more than one log as compared to the pre-intercourse specimen. For example if 1000 colonies were found in the pre-intercourse specimen, 10,000 colonies were found in the post-intercourse specimen. In the remaining 53 episodes, there was a less than one log increase in bacterial counts between the pre-intercourse and post-intercourse specimens. The bacteriuria was transient and asymptomatic. In the 23 samples that were bacteriuric post-intercourse, sixteen were abacteriuric at the time of the specimen collected 40 hours post-intercourse. All of the women were abacteriuric at the time the next pre-intercourse specimen was collected. The time interval

between these samples was not reported. To obtain control samples, the couples also collected specimens at the same time intervals described above but without having had intercourse. There were no increases in bacterial colony counts in these samples in any of the women.

In a classic study, Kunin and McCormack (1968) compared the incidence of bacteriuria in working women to nuns of a similar age. Bacteriuria was much less common in nuns, but the incidence increased with age within all age groups. Kunin found that married women had twice the number of episodes of UTI than did nuns of a similar age. Kunin and McCormack concluded that celibacy was important in protection from UTI and also reported that girls destined to become nuns differed distinctly in susceptibility to urinary colonization from girls in the general population. In later work, Kunin (1978) proposed that the relationship between sexual intercourse and the onset of urinary tract infection was purely coincidental. He assumed that the average woman had intercourse three times per week and concluded that any UTI would occur within two days of intercourse. Kunin's argument was that because of the frequency of sexual intercourse, the coincidental occurrence of sexual intercourse and UTI would lead to the erroneus impression of a causal relationship. Kunin's assumption of the

frequency and regularity of the sexual activity of women may not be correct for many women. Kunin also did not address UTI occuring after first sexual experience, or UTI occurring after sexual activity preceded by a period of abstinence.

In a study designed to replicate the mechanical introduction of bacteria into the urinary tract during sexual activity, Bran et al. (1972) attempted to simulate the manipulation of the urethra and periurethral glands that occurs during intercourse by manually milking the glands while the 28 female subjects aged 17-64 were under anesthesia. They found low numbers of bacteria in the urine of 25% of subjects upon suprapubic bladder aspiration. None of the subjects had significant bacteriuria (more than 100,000 colonies per milliliter) and none of the subjects had a symptomatic infection.

It is also controversial whether voiding soon after intercourse will decrease the incidence of UTI. In the Buckley et al. (1978) study described earlier, when urine samples from subjects who did not void until 6-10 hours after intercourse were compared to samples from subjects who voided within one hour of intercourse, no difference the the incidence of bacteriuria was noted. However, the small sample size and the low incidence of bacteriuria found in the study may have affected this finding.

Ervin, Kamaroff, and Pass (1980) studied 23 women

seeking health care for dysuria, urinary frequency or urgency who had 100,000 colonies of a single organism in a clean catch midstream urine sample. The mean age of the participants was 32 years. The sample was described as working women and housewives of diverse socioeconomic background. These women were interviewed by a nurse and answered a self-administered questionnaire regarding health habits and behaviors. A control group of 64 women who were seeking health care for problems unrelated to UTI and who had experienced no more than one UTI in the past underwent the same interview and answered the questionnaire. There was no statistical difference between the study and comparison group when asked if they voided within one hour of coitus. Although Ervin et al. describe the study as prospective, the information was gathered retrospectively through interview and questionnaire. There is no mention of any contact with the subjects or information gathering beyond the initial interview. It was not reported whether the behaviors asked by the questionnaire relfected the subject's current behavior, behavior in last two weeks, or behavior prior to development of the dysuria, frequency or urgency. In addition, the urologic history of the study group was not reported. It is not known whether the study group had multiple or no UTIs in the past. These differences may be important in making comparisons

between the two groups. Adatto, Doebele, Galland, and Granowetter (1979) in a study of 84 female university students ages 18-35 (median age 21 years) with a history of three documented UTIs found that only 8% of the subjects voided within ten minutes of coitus. Sixty eight percent of a comparison group of 84 students seeking medical care at a student health service for non-UTI related problems reported voiding within ten minutes of coitus. This difference was significant ($\underline{x}^2$ = 7.91, $\underline{p}$ < .01). Although these two studies report contradictory findings it is important to note that the two study groups differed in several ways. In the study by Ervin et al. the subjects were older and the urologic history of the subjects was not reported. The interval between intercourse and voiding differed in the two studies (ten minutes vs. one hour). The subjects in the study by Ervin et al. were experiencing a UTI; Adatto et al. do not report whether the subjects were infected at the time the questionnaire was answered. It is unknown but possible that these differences may have affected the results.

Other characteristics of voiding patterns may be important in the occurrence of UTI. Ervin et al. (1980) and Adatto et al. (1979) also gathered information about frequency of voiding and voluntary retention of urination after the need to urinate was noted. Adatto et al. found

that 61% of subjects with a history of three UTIs voluntarily delayed voiding for more than one hour after they first noted the urge to urinate. More than two-thirds of this group delayed urinating for more than three hours. In contrast, only 11% of subjects without a history of UTI delayed urinating for more than one hour. This difference was statistically significant ($\underline{x}^2$ 45.6, $\underline{p}$ < .001). Ervin et al. found that patients seeking medical attention for UTI voided an average of 4.7 times per day. In contrast, control subjects, those with no more than one UTI in the past and not reporting dysuria, frequency or urgency voided an average of 5.9 times per day. This difference was reported as statistically significant at $\underline{p}$ < .05 but the type of test used was not reported.

It is not clear whether the number of urinations in the group of subjects seeking attention for UTI was the patient's usual behavior when they were not experiencing a UTI or whether the question was asked in terms of current behavior. Because many UTIs are characterized by urinary frequency, it would be expected that the UTI group would have a higher average number of urinations per day during UTI than the comparison group. UTIs are also characterized by dysuria, and it could be argued that women would voluntarily refrain from voiding to avoid pain and the number of urinations would be lower in

this group. Adatto et al. anecdotally report that their
subjects said that although voiding was painful during a
UTI, refraining from urinating was more painful. It is
important to know whether the subjects were asked the
questions when infected and whether behaviors were asked
in terms of prior or current behavior.

Many factors could influence the number of times a
woman urinates per day. Adatto et al. cite inconvenience
and embarrassment as reasons women may delay voiding and
thus void fewer times during the day. Another factor
which influences the amount of urine produced per day and
indirectly the number of times a women urinates per day
is the amount of fluid intake. In the study described
earlier. Ervin et al. (1980) found that subjects with a
history of UTI had a significantly lower fluid intake
than control subjects (5.6 cups vs. 7.0 cups; p <.05).
In contrast, Adatto et al. (1979) reported no difference
in fluid intake. Again, these data were collected
retrospectively by questionnaire and the groups differed
as previously described.

Although there is no evidence that certain types of
fluid cause UTI, there is some evidence that types of
fluid may prevent UTI. Bodel, Cotran and Kass (1959)
reported that ingestion of cranberry juice lowered urine
pH slightly. In a more recent study, Schultz (1984)
studied 3 women and 5 men with multiple sclerosis and

found that drinking cranberry juice and taking ascorbic acid lowered the urine pH. In both studies, the reduction of urine pH was insufficient to prevent UTI. An increased fluid intake decreases the osmolarity of the urine. However, Asscher et al. (1966) noted that an increased osmolarity of the urine was associated with a reduction in the ability of the urine to support the growth of uropathogens. In summary, the evidence is inconclusive regarding the effect of fluid intake on the development of UTI. The inconsistency of these findings may be due to differences in the characteristics of the study samples. Many young women use contraceptive methods to prevent pregnancy. The use of a diaphragm for contraception is believed by some investigators to be a contributing factor in the development of urinary tract infections (Fihn, Latham, Roberts, Running, & Stamm, 1985; Foxman and Frerichs, 1985; and Gillespie, 1984). The diaphragm rests against the bladder neck and rectum and can alter normal bladder and urethral function in three ways. First, the diaphragm may interfere with bladder emptying, resulting in a pool of residual urine where bacteria multiply. Second, urethral urine flow rates may be reduced. Third, use of a diaphragm may increase intravesical pressure, reduce mucosal blood flow and make the stretched bladder mucousa more susceptible to infection.

Gillespie (1984) in a study of 150 nulliparous women ages 16-35 who were referred for evaluation for recurrent urinary tract infection, found that 69% of the women used a diaphragm for contraception. In contrast, 11% of the sample used intrauterine devices, 7% used oral contraceptives, 5% used condoms and foam, 1% used no contraception. The contraceptive method of 10 women (7%) is not reported. Of the women who used a diaphragm, sixty-seven percent reported a poor urine stream after sexual intercourse. Urologic studies were done to determine how the diaphragm may interfere with normal bladder and urethral function. Residual urine volumes were increased from 2 cc when the woman did not have the diaphragm in place to 40 cc when the diaphram was used. Urine flow rates were reduced from a normal of 18-20 ml/second to 12-13 ml/second when the diaphragm was in place.

Foxman and Frerichs (1985) also examined diaphragm use as a possible contributing factor in the development of UTI. The comparison groups used in this study have been described earlier. Twenty-two percent of the control group, 48% of the primary group, and 58% of the secondary group used a diaphragm. In both studies, when the investigators statistically controlled for the variable of frequency of sexual intercourse, the positive association between diaphragm use and urinary tract

infection remained. Other investigators have noted an association between UTI and use of oral contraceptives. In a study of 12,076 women Takahashi and Loveland (1974) found a higher incidence of UTI in women currently using oral contraceptives when compared to women not using oral contraceptives. The increased incidence was attributed to anatomical and physiological changes in the urinary tract caused by exogenous estrogen. There were no studies found which reported that the use of an intrauterine device or condom and/or foam was associated with UTI.

Few studies have examined the relationship between the type of menstrual protection used and the occurrence of urinary tract infection, and the results are contradictory. The use of tampons was found to be related to the development of UTI in one study (Foxman and Frerichs, 1985b). Foxman and Frerichs hypothesized that the insertion or removal of tampons may spread bacteria from the vagina to the urethral opening. Bladder emptying may be inhibited by tampon use if the tampon compresses the urethra. In contrast, in a study of 1755 premenopausal women, Kunin and McCormack (1968) found no relationship between urinary tract infection and tampon or sanitary napkin use.

Women are often instructed that wearing tight pants and synthetic undergarments may cause UTIs. Foxman and

Frerichs (1985b) examined the relationship between types of clothing worn by women and urinary tract infection. Wearing pantyhose was positively associated with development of a primary UTI; a negative relationship was found between primary UTI and cotton or synthetic undergarments, jeans, pants, and slacks. Wearing cotton undergarments showed a strong positive association with secondary UTI; wearing synthetic undergarments showed a mild positive relationship. Tight jeans were strongly associated with primary UTI and moderately associated with secondary UTI. It is unclear from this study whether it is the type or tightness of clothing or some other, unidentified factor which accompanies this behavior that results in the UTI.

Little research has been reported on the association between the use of bubble bath and the occurrence of UTI. Johenning (1961) studied 20 young girls with urologic dysfunction to see if urethral reflux occurred while bathing. The children sat in suspensions of powdered charcoal, barium, india ink and methylene blue. Methylene blue and charcoal were found in the urine samples obtained by catheterization after the subjects had sat down in the suspension ten times in a rapid, forceful manner. From these findings, Johenning concluded that bubble baths were associated with UTI. It is difficult to generalize these findings because of the

differences between bubble bath and the suspension used in this study, sample characteristics, and the differences between using bubble bath and repeatedly sitting down forcefully in suspensions of methylene blue and charcoal. In summary, various behavioral factors have been identified by some investigators as associated with the development of UTI. However, none of the factors were consistently found to be associated with UTI. Study sample characteristics, definitions, and measurements used by investigators varied in these studies. No report was found in the literature which examined all of the behavioral factors thought to be associated with UTI.

Conceptual Framework

The review of the literature revealed that there are factors which have been found by other investigators to be associated with UTIs. These factors may be categorized as physiological, pathophysiological, and behavioral. These relationships are visually depicted in Figure 1. There may be interactions between these variables (depicted by dotted lines) but these potential interactions are beyond the scope of this study. The following operational definitions were used in this study.

1) Physiological factors: Factors associated with the normal functioning of the healthy female.

2) Pathophysiological factors: Factors associated with altered physiological function.

3) Behavioral factors: Factors pertaining to habits and behaviors of an individual.
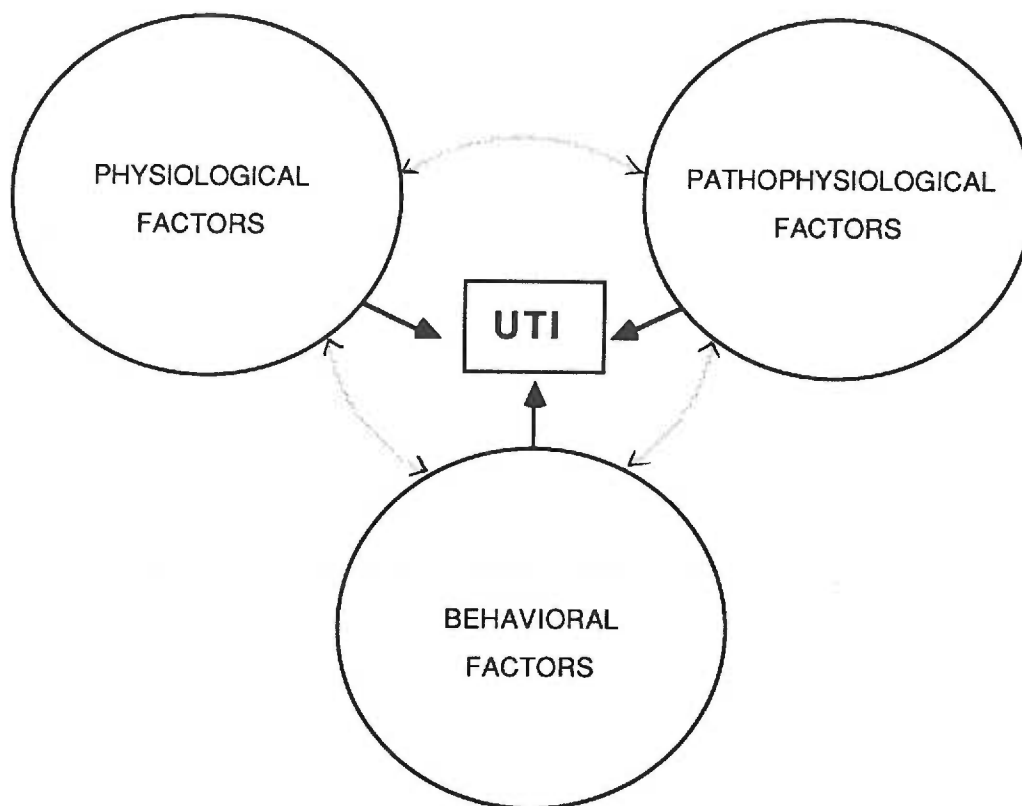
Figure 1.   Association between UTI and physiological, pathophysiological, and behavioral factors.

Purpose of the Study

There were no studies found which examined all of the habits and behaviors suggested by other investigators

to be associated with UTIs in young women. Nor were any studies found that identified behavior which immediately preceded the last UTI and which also identified current behaviors. Women may change their behavior in response to their last UTI, and so their current behavior may differ from behavior immediately preceding the last UTI.

UTIs in young women may result in actual and potential health problems, pain and discomfort, interference of activities of daily living and ability to function in a given role. There may be factors associated with the occurrence and maintenance of UTIS. The purpose of this study was to examine and describe these variables in young women with a prior history of UTIs and young women who have never had a urinary tract infection. Specifically the following research questions were asked:

1) Is there a relationship between selected physiological, pathophysiological and behavioral factors and a past history of urinary tract infection?

2) Are there differences between selected physiological, pathophysiological and behavioral factors in women with a past history of UTI and in women without a past history of UTI?

3) In women with a prior history of UTI, are there differences between selected current behavioral factors and past behavioral factors?

CHAPTER II

METHODS

One of the aims of this study was to identify habits and behaviors which were associated with a history of UTI. A second aim was to describe characteristics which differentiated women who had never experienced a UTI from women with a past history of UTI. A third aim of this study was to describe changes in habits and behaviors in women with a past history of UTI they last experienced a UTI.

Design

This study was conducted using an ex post facto descriptive design wherein women ages 18-35 were asked to answer a written questionnaire. Questionnaire items addressed the subject's urological history and habits and behaviors associated with UTI.

Research Setting and Sample

A convenience sample of women with a self-reported history of at least one prior urinary tract infection and those without a self-reported history of prior urinary tract infection were recruited in a large metropolitan area. The subject age range was limited to women aged 18-35 in order to minimize the potential influence of increased age on the incidence of UTI and to provide a

more homogeneous group. Recruitment was accomplished by
use of written and posted notices and by verbal contacts.
Participation in the study was voluntary and subjects
were not compensated for their participation.

Instruments

No suitable standardized instruments for surveying
habits and behaviors associated with UTI were found.
Therefore, the investigator developed the questionnaire
for use in this study. The literature review revealed
many factors which have been found in other studies to be
associated with the development of UTI. Questions were
formulated which addressed each of these factors. The
instrument used in this study was a five page, 37 item,
self-administered written questionnaire. The
questionnaire was initially given to five baccalaureate-
prepared nurses to confirm that the questions were easily
understood. The five women returned the completed
questionnaires and reported no difficulty with the
questions. No modifications were made to the
questionnaire after the pilot testing and these five
subjects were included in the final sample. The
questionnaire has not been used or tested elsewhere. The
rationale for inclusion of each questionnaire item is
included in Appendix A and a copy of the questionnaire
and cover letter are included in Appendix B.

Data Collection Procedure

Data for this study were collected over a three month period (December 1986- February 1987) in a health care setting in a large metropolitan area of approximately 400,000 people in the Pacific Northwest. Potential subjects (women ages 18-35) were contacted by the investigator individually or in groups. Contacts were made in a variety of ways. Twenty of the subjects were approached as members of a sophomore nursing class from a baccalaureate program. A five minute presentation which described the purpose of the study and the questionnaire and encouraged participation was made to the class by the investigator. Some subjects were approached as acquaintances or co-workers of the investigator. A written notice was placed in the employee lounge on a nursing unit. Questionnaires and envelopes were placed in the personal mailbox of each female employee on that nursing unit. Subjects who agreed to complete the questionnaire were encouraged to recruit friends or associates who would participate.

A cover letter accompanied each questionnaire which briefly described the purpose of the study. The cover letter assured the participants of anonymity and confidentiality, and thanked them for their contribution to the project. Consent to participate was implied in the act of completing the questionnaire and returning it

to the investigator. The questionnaire contained directions which fully explained the process of answering the questionniare and participating in the study. Each subject took approximately ten minutes to complete the questionnaire. An envelope addressed to the investigator was attached to each questionnaire. The questionnaires were sealed in the envelopes by the subjects and returned to the investigator by hand, by U.S. mail, or in the case of subjects at the investigator's institution, through intra-agency mail.

Data Analysis Procedures

Three different statistical tests were used to analyze the data obtained in this study. For interval level variables, the differences in the means between the two groups were analyzed through the use of a t test. The t test was used when women with a prior history of UTI were compared to women without a prior history of UTI. When the past behaviors of women with a prior history of UTI were compared to the current behaviors of these women, a dependent t test was used to compare the means. Categorical data, such as comparison of proportions between groups and between current and past behaviors of women with prior UTIs, was analyzed through the use of z score analysis. Because a large number of variables were to be compared, a conservative alpha level of .01 was set for statistical significance, thereby

decreasing the number of significant findings that might
have occurred by chance alone.

CHAPTER III

RESULTS

In order to address each research question, the results are presented in the following way. First, the characteristics of the sample are presented using descriptive statistics. Results which address physiological,pathophysiological, and behavioral factors of the two groups are then presented. Finally, a comparison between past and current behaviors of women with UTI is presented.

Description of the Sample

A total of 115 questionnaires were distributed to potential study participants. Eighty-two questionnaires were returned, yielding a response rate of 71.3 percent. Of the 82 returned questionnaires, 6 were excluded from data analysis because the respondents reported their age as greater than 35 years. The final sample numbered 76. Of this number, 38 women had experienced at least one UTI in the past and 38 women had never experienced a UTI.

Physiological factors

Physiological factors assessed by this questionnaire included age, past pregnancy, current pregnancy, pregnancy concurrent with UTI, and relationship between the menstrual cycle and occurrence of UTI. The data are presented in tabular form in Appendix C.

The subjects with a past history of UTI were

significantly older than the subjects without a history
of UTI. The mean age of women without a prior UTI was
24.4 years, while the mean age of the women with a prior
history of UTI was 29.5 years ($\underline{t}$ = 4.93, $\underline{p}$ < .001). For
the women with a past history of UTI, the mean age at
which they experienced their first UTI was 18.4 years,
standard deviation was 6.093, median 20 years, and range
2-30 years. Although the women with a past history of UTI
were statistically significantly older than the women
without a past history of UTI, the majority of the women
without UTI was older than the mean age at which the
women with a past history of UTI had experienced their
first infection.

A significantly higher percentage (50%) of the women
with a past history of UTI reported being pregnant in the
past. Only 18.4 % of the women without a past history of
UTI reported being pregnant in the past. This difference
was statistically significant ($\underline{z}$ = 3.15, $\underline{p}$ < .01).

There were no statistically significant differences
between groups in present pregnancy. Of the women with a
past history of UTI, only one women reported that a UTI
had been concurrent with pregnancy. Of the 36 women who
answered the question regarding a relationship between
the menstrual cycle and onset of UTI, 32 reported no
relationship between the two events. Of the 4 subjects
who could identify a relationship, one subject reported

that her bladder infections were more likely to occur one week after menses, and one noted that a UTI was likely to occur 2 weeks post-menses. Two subjects noted that the symptoms of UTI occurred immediately before menses.

Pathophysiological factors

Pathophysiological factors assessed by this questionnaire included incomplete bladder emptying, diabetes, and urological and gynecological procedures which involved instrumentation of the urethra, bladder, or vagina. The only pathophysiological factor found to be statistically significant was urogenital instrumentation. These data are presented in tabular form in Table 1.

Table 1
The Incidence of Urogenital instrumentation
In Women With and Without a Past History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
none	31 (81.57%)	18 (47.36%)	3.3 *
D & C	2 (5.26%)	1 (2.63%)	0.6
cystoscopy	0 (0%)	5 (13.16%)	2.3
hysterectomy	0 (0%)	0 (0%)	0.0
bladder surgery	0 (0%)	1 (2.63%)	1.0
catheter	5 (13.16%)	13 (34.21%)	2.2
abortion	1 (2.63%)	7 (18.42%)	2.3

* $p < .01$

More subjects with a past history of UTI reported having undergone a procedure which involved urogenital instrumentation. Over half of the women with a past history of UTI had undergone at least one such procedure. In contrast, 81% of the non-UTI group had never done so. This difference was statistically significant (z = 3.3, p < .01). A greater number of subjects in the UTI group reported a past cystoscopy and uretheral catheterization. Urogenital instrumentation reportedly led to a UTI in only two women.

There were no significant differences between groups in terms of incomplete bladder emptying or diabetes mellitus. None of the women without a past history of UTI reported incomplete bladder emptying. Two subjects with a past history of UTI said that they had been told that their bladder did not empty completely. One subject noted that her bladder was capable of emptying completely, but that she was told that she did not always fully empty her bladder. No subjects in either group reported a history of diabetes mellitus.

Behavioral factors

Behavioral factors assessed by this questionnaire included hygienic practices, sexual activity, fluid intake, menstrual protection, contraceptive use, voiding patterns, and type of clothing worn. The data are presented in tabular form in Appendix C. Differences

between the two groups regarding past and current sexual activity and use of a condom for contraception were statistically significant. A greater percentage of the UTI group were currently sexually active (z = 2.98, p < .01) and had been sexually active in the past (z = 2.97, p < .01). Eighteen percent of the women without a past history of UTI had never been sexually active. Sixteen percent of the women with a past history of UTI reported that their partner used a condom for contraception while none of the women without a past history of UTI reported using that method. This difference was statistically significant (z = 2.68, p < .01).

There were no statistically significant findings between the two groups in the remainder of the behavioral factors. Specifically, there was no relationship between past history of UTI and sexual preference, age at onset of sexual activity, perineal hygiene, use of bubble bath, amount of fluid intake, number of urinations per day, time interval between sexual intercourse and voiding, tightness of clothing and type of underwear.

Among subjects in both groups who reported a preference, 100% stated their sexual preference as heterosexual. The average age for onset of sexual activity was 18.6 years for the women without a history of UTI and 18.4 years for the women with a past history of UTI. Among the women with a past history of UTI,

there was no relationship between age at onset of sexual activity and first UTI. Over one-half (54%) of subjects reported a relationship between sexual intercourse and the onset of UTI. Twenty one percent noted that sexual intercourse often resulted in a UTI. Twenty four percent reported that sexual intercourse did not always lead to UTI, but that UTIs were often or always preceded by sexual intercourse.

The majority of both groups reported cleaning the perineum in a front to back manner after defecating. However, thirty-one percent of the women without a history of UTI reported cleaning in a back to front manner, whereas only 10% of the women with a past history of UTI did so. Approximately half of both groups used bubble bath. The average daily fluid intake for the women without a history of UTI was 6.12 cups. The average intake for the women with a past history of UTI was 6.75 cups. The average number of urinations per day for the women without a past history of UTI was 5.7, whereas the average for the women with a past history of UTI was 6.4.

The average time interval between sexual intercourse and voiding was 2.021 hours for the women without a history of past UTI. The interval for women with a past history of UTI was 2.108 hours. The majority of subjects in both groups used a combination of tampons and sanitary

napkins for menstrual protection.

For the purposes of analyzing the association between contraception and UTI, the women who were not currently sexually active were removed from the sample. These results are presented in Table 2. Twenty-one percent of the women with a past history of UTI used a diaphragm for contraception, while only 15% of the women without a past history of UTI used a diaphragm. Among women with a past history of UTI, 32% used oral contraceptives. In contrast, 42% of the women without a past history of UTI used oral contraceptives. No attempt was made to statistically control for the frequency of sexual intercourse.

Table 2
Type of Contraception Used by Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	26	37	
diaphragm	4 (15.38%)	8 (21.62%)	1.02
foam	2 (7.69%)	0 (0%)	0.64
OC [a]	11 (42.31%)	12 (32.43%)	0.79
condom	0 (0%)	6 (16.22%)	2.68*
none	4 (15.38%)	6 (16.22%)	0.97
tubal	2 (7.69%)	3 (8.11)	0.06
vasectomy	2 (7.69%)	2 (5.41%)	0.35

* $p < .01$
[a] oral contraceptives

Twenty-five percent of the women without a history of UTI and 23.68 % of the women with a past history of UTI reported wearing tight or very tight pants, jeans, or trousers. Approximately 69% of the women without a past history of UTI and 74% of the women with a past history of UTI wore loose or very loose pants, jeans, or trousers. The majority of the women with a past history of UTI wore cotton underwear, while the majority of women without a past history of UTI wore synthetic underwear with a cotton crotch. None of the subjects without a past history of UTI and 2.63% of the subjects with a past history of UTI wore underwear made completely of synthetic fabric.

Past and Current Behaviors

Subjects who reported a past history of UTI were asked to answer several questions that addressed habits and behaviors immediately preceding their last infection. These responses were then compared to their current behavior to determine changes in behavior since their last UTI. The past and current behaviors examined by this questionnaire were amount of fluid intake, contraception, pregnancy, menstrual protection, perineal hygiene, intercourse-urination interval, use of bubble bath, tightness of clothing, and type of underwear worn. When these data were compared, the only factor which was statistically significant was the reduction in use of a

tampon for menstrual protection. These data are shown in
Table 3. Results of the non-significant past and current
behaviors are presented in tabular form in Appendix D.

The women who reported a prior history of UTI were
also asked to describe the symptoms which occurred with a
UTI. These reponses, as well as written comments made by
these women are found in Appendix E.

Table 3

<u>Type of Menstrual protection Used</u>
<u>Currently and Prior to Last UTI</u>

	Past	Current	z
N	37	38	
none	2 (5.41%)	1 (2.63%)	0.64
tampons	23 (62.6%)	14 (36.84%)	2.6 *
napkins	3 (8.11%)	7 (18.42%)	1.3
tampons/ napkins	8 (21.62%)	16 (42.11%)	1.96
other	1 (2.70%)	0 (0%)	1.02

* $p < 0.01$

CHAPTER IV

DISCUSSION

The statistically significant findings of this study included six factors which were associated with a past history of UTI. These factors were past and current sexual activity, urogenital instrumentation, age, pregnancy and use of a condom for contraception.

Although many of the statistically significant findings were supportive of the findings reported in the literature, other findings were not similar to those reported by other investigators. The age of the women with a past history of UTI was statistically higher than the age of the women without a prior history of UTI. These findings are consistent with those of Evans et al. (1978) who reported that the incidence of UTI increases with age. It should be noted that the age limits of women in this study were intentionally restricted to obtain a more homogeneous sample and to avoid the affect of age on the incidence of UTI.

A higher percentage of the women with a past history of UTI were currently sexually active and had been sexually active in the past when compared to the women without a prior history of UTI. These findings are similar to those reported by Kunin and McCormack (1968). Many subjects reported that UTI often followed sexual activity, but none of the women reported that sexual

activity always resulted in UTI. These findings may have been affected by the fact that the women with a prior history of UTI were older than the women without a prior history of UTI and were more likely to be or to have been sexually active.

Williams et al. (1975) reported an increased incidence of UTI with parity. This finding was supported by the results of the current study. However, the increased incidence of pregnancy may be due to the increased age of the women with a prior history of UTI.

Urinary tract infections were found to result from instrumentation of the urogenital tract in several studies (Cleland, Cox, Berggren, and MacInnis, 1975; Stamm, 1975; Mustafa & Pinkerton, 1968). The results of this study support these findings. An alternative explanation of this finding is that the occurrence of urogenital instrumentation in the women with a prior history of UTI may have been due to undergoing some of these procedures for diagnostic purposes to evaluate the cause of recurrent UTI. Information that might have made this association more clear was not obtained in the current study or in any of the studies cited.

The association between condom use and UTI has not been reported in the literature. It has been reported by Stamey (1971) and Elkins and Cox (1974) that the presence of uropathogenic organisms on the perineum often precedes

a UTI. The use of a condom should reduce the transmission of these microorganisms between sexual partners. This questionnaire did not address other variables associated with sexual activity such as number of sexual partners or the rationale for choosing a particular type of contraceptive. It is possible that the women with a past history of UTI may have had a higher incidence of condom use because they employed this method to prevent sexually transmitted diseases, making the asssocation between condom usage and UTI coincidental.

Among women with a past history of UTI, there was a decrease in the percentage of women using tampons for menstrual protection. Use of tampons by women without UTI and current use of tampons by women with a prior history of UTI was similar. This finding suggests a change in behavior over time for women with a prior history of UTI. This study did not address the rationale for the change in the behavior. Perhaps this change was made for other reasons, for example to avoid toxic shock syndrome, and thus the association with UTI may be coincidental.

When the behaviors of women with and without a prior history of UTI were compared in this study, the only behavioral factors associated with UTI were sexual activity and use of a condom for contraception. Other

investigators have found relationships between the other behavioral factors that were measured in this study and UTI (Adatto, Doebele, Galland, & Granowetter, 1979; Ervin, Kamaroff, & Pass, 1980; Fihn, Latham, Roberts, Running, & Stamm, 1985; Foxman and Frerichs, 1985a; Foxman and Frerichs, 1985b; and Takahashi & Loveland, 1974). However, the lack of association between selected behavioral factors and UTI in this study might be due to measurement difficulties or sampling error. In any case, the literature remains inconclusive.

Behavioral factors are more difficult to measure than physiological or pathophysiological factors because it is more difficult to precisely recall behavioral factors. For example, it is easier to correctly recall physiological factors such as age or past pregnancy than to recall average daily fluid intake. It is also possible that many behavioral factors were not found to be associated with UTI in this study because this sample may not be representative of women with a past history of UTI.

The findings discussed previously were statistically significant at $p < .01$. Six additional factors were statistically significant at $p < .05$. Although this level was not considered significant for the purposes of this study, these results are reported here to identify and discuss trends. Three types of urogenital

instrumentation were statistically significant at p <
.05. These included urinary catheterization (z= 2.2),
cystoscopy (z = 2.3), and abortion (z = 2.3). As
mentioned earlier, urinary catheterization and cystoscopy
could contribute to the development of UTI or could be
done for diagnostic purposes to determine the cause of
recurrent infection. It is not known why these
procedures were performed on subjects in this sample. It
is unclear how abortion is associated with UTI. This may
be a spurious correlation due to the increased incidence
of past pregnancy among the women with a prior history of
UTI. The high incidence of perineal cleansing from
rectum toward urethra by the women without a prior
history of UTI (z= 2.39, p < .05) is not consistent with
the literature. There were no published reports which
found that cleansing the perineum from rectum toward
urethra was associated with a decreased incidence of UTI.

Among women with a prior UTI, there was an
association between the age at onset of sexual activity
and age when the subject first developed a UTI (t = -.27;
p < .05). There were, however, four women in this sample
who experienced their first UTI between age 2 and age 10
and did not become sexually active until several years
later. There was an increased current use of a
combination of tampons and napkins by women with a prior
history of UTI. This finding may be a reflection of the

decreased current tampon only use discussed earlier.

Limitations of the Study

The limitations of the study included the convenience sample and the potential for inaccurate reporting by the subjects. This study was based on the assumption that young women could and would report signs and symptoms of UTI. It was also assumed that the subjects were knowledgeable about their past medical history and would honestly report this information. Because of the varied length of time between last UTI and completion of the questionnaire it is possible that some subjects would have been unable to recall their habits and behaviors immediately prior to their last infection. It is also possible that the women who volunteered for this study were not representative of young women ages 18-35 or of women who have a history of prior UTIs. Subjects who entered the study without a prior history of UTIs may not have been representative of young women without a prior history of UTI.

The subjects were divided into two groups based on their report of a prior UTI. Medical records were not reviewed and urine cultures were not obtained. It is possible that subjects who reported a prior UTI may not have had a UTI and that subjects who reported never experiencing a UTI may have actually had an infection in the past.

In order to ensure honest responses and reliable data on a potentially sensitive topic, the data collection process was designed to protect the anonymity of the subjects and provide for confidentiality. The only demographic information gathered about the participants was age. It can be inferred from the study location that the majority of respondents were registered nurses and that a small subset (20) of the total sample were sophomore nursing students in a baccalaureate program. The lack of demographic information obtained from the subjects does not allow for precise description of the sample and limits the generalizability of the findings.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This ex post facto study sought to gather information regarding habits and behaviors associated with UTI in young women. Data were gathered to describe characteristics which differentiated women who had experienced a UTI from women who had never experienced a UTI. To address changes in the behavior of women since their last UTI, information was collected regarding past and current behavior of women with a past history of UTI.

The significant findings of this study included past sexual activity, current sexual activity, urogenital instrumentation, age, past pregnancy, and use of a condom for contraception. No significant differences were found between groups on incomplete bladder emptying, amount of fluid intake, perineal hygiene, age at onset of sexual activity, number of urinations per day, time interval between sexual intercourse and voiding, type of menstrual protection, tightness of clothing, type of underwear, and use of bubble bath. Among women with a prior history of UTI, when current behaviors were compared to behaviors immediately prior to the woman's last UTI, there was a statistically significant difference in use of tampons for menstrual protection. There were no other statistically significant differences between past and

current behaviors.

Implications for Nursing

Although it is important to be cautious when making generalizations from a convenience sample, the findings of this study have implications for nursing theory, practice, and research. The majority of factors shown in this study to be associated with UTI are physiological and pathophysiological. Nursing intervention will not have an impact on factors such as age, past pregnancy, or urogenital instrumentation. Many behavioral factors, including type of menstrual protection, contraception, amount of fluid intake, number of urinations per day, use of bubble bath, tightness of clothing, type of underwear, perineal hygiene, and time interval between sexual intercourse and urination were not shown to be associated with UTI in this study. However, these variables were found by other investigators to be associated with UTI. It is possible, that although these variables were not shown to be associated with UTI in this study, they may play a role in the occurrence of UTI in some individuals. Nurses could assist individual clients in identifying factors which are associated with UTI for that individual. Practice of these behaviors is without cost or relatively inexpensive. In most cases, the only change necessary is a change of habit. These interventions are non-invasive, but require time to teach

the patient how these behaviors may affect the occurrence of UTI.

The findings of this study suggest several topics for further study. Replication of this study with a random, stratified sample may yield different results. Expansion of subject age limits would describe this problem in younger and older age groups. To avoid the possible problem of inaccurate recall of past behavior, subjects should be studied prospectively by keeping a diary of behavioral factors, or the subjects could be studied at frequent intervals so that the time interval between the most recent UTI and answering the questionnaire would be shorter. If the presence or absence of UTI was documented by urine culture, the potential problem of inaccurate reporting of past UTI would not be an issue. Gathering diary information about sexual activity and statistically controlling for the variable of frequency of sexual intercourse may yield more information regarding the association between contraceptive method and UTI. In addition, this is the only study to report an association between use of a condom for contraception and prior history of UTI. Because this may be a spurious correlation, these findings should be corroborated by other investigators before they are applied to clinical practice.

Once behaviors associated with UTI have been

identified, it will be important to find what type of educational process is most effective in teaching women behaviors that they may practice to prevent the occurrence of UTI.

Although this descriptive ex post facto study had limitations, several significant associations between selected physiological, pathophysiological, and behavioral factors and UTI were found. Recommendations for nursing practice and further study were made based on the findings of this study.

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California, Rand Corporation.

APPENDIX A

RATIONALE FOR QUESTIONNAIRE ITEMS

1. Physiological factors:
   Age
   Past pregnancy
   Current pregnancy
   Pregnancy concurrent with UTI

Rationale: There may be an increased incidence of UTI
with increased age (Evans et al., 1978). Age may also be
a confounding variable in the studies that report an
increased incidence of UTI with increased parity
(Huffman, 1962; Lenke & Stamm, 1986; Williams, Reeves,
Condie, & Brumfitt). Physiological changes which occur
with pregnancy may alter bladder and ureteral function
which predisposes the pregnant woman to UTI (Lenke &
Stamm, 1986).

2. Pathophysiological factors:
   Urogenital instrumentation
   Diabetes mellitus
   Incomplete bladder emptying

Rationale: Urological and gynecological procuredures
often introduce bacteria into the urethra and bladder and
the incidence of UTI is increased after instrumentation
of the genitourinary tract (Cleland, Cox, Berggren, &
MacInnis, 1971; Mustafa and Pinkerton, 1968; Stamm,
1975). Disease processes which alter host defense
mechanisms may result in UTI. Women with diabetes
mellitus are more prone to all types of infection
including UTI (Ellenberg, 1980; Shand, 1970). Disease
processes which interfere with bladder emptying allow
organisms to multiply in bladder urine (Shand, 1970).

3. Behavioral factors:

   Sexual activity
      Past sexual activity
      Current sexual activity
      Sexual preference
      Contraception

   Rationale: The relationship between intercourse and
the development of UTI remains controversial. Bacteria
are introduced into the bladder and urethra during
intercourse, but the bacteriuria is often asymptomatic
and transient, and a symptomatic UTI does not occur after
every episode of sexual activity (Bran, Levison & Kaye,
1972; Buckley, McGuckin, & McGregor, 1978; Kunin &

McCormack, 1968).   There are anecdotal reports of UTIs occuring with the first episode of sexual activity. Studies have examined this factor in heterosexual couples.   It is not known whether these findings can be generalized to homosexual women.

    Voiding patterns
      Fluid intake
      Number of urinations per day
      Interval between intercourse and voiding

Rationale: An increased fluid intake results in increased urine output, and urination mechanically flushes bacteria from the bladder.   However, it has been found in one study that increased urine osmolarity inhibits bacterial growth (Asscher, Sussman, Waters, Davis, & Chick, 1966).   Two studies have conflicting conclusions regarding the influence of amount of fluid intake, number of urinations per day, and interval between sexual activity and voiding on UTI (Ervin, Kamaroff, & Pass, 1980; Adatto, Doebele, Galland, and Granowetter, 1979).

    Perineal hygiene

Rationale: The presence of uropathogenic organisms present on the introitus may contribute to the development of UTI in some women (Cox, 1966; Cox, Lacy, & Hinman, 1968; Elkins & Cox, 1974; Fair, Timothy, Millar, & Stamey, 1970; Stamey, 1973). Cleaning the perineum from the rectum to the urethra may cause uropathogenic organism to be present on the introitus.

    Menstrual protection

Rationale: Tampons may interfere with bladder emptying and bacteria may multiply in the remaining pool of residual urine.   The introitus may be contaminated with organisms as the tampon is inserted or removed (Foxman and Frerichs, 1986).

    Tightness of clothing
    Type of underwear

Rationale: One study found an assocation between tightness of clothing and type of underwear and UTI (Foxman and Frerichs, 1985) but this relationship is often cited anecdotally in the literature.

Bubble bath

Rationale: The detergents and soaps in bubble bath
may cause urethal irritation and contribute to the
development of UTI. One study was found which examined
this relationship, but the findings could not be
generalized to this population (Johenning, 1961). Foxman
and Frerichs (1985) found an association between use of
bubble bath and deodorant soap and UTI.

APPENDIX B

The attached questionnaire is part of a research project entitled,
"Habits and Behaviors Associated with Urinary Tract Infections in
Young Women". Robin Conner, RN, BSN, is conducting the study under
the direction of Dr. Carol S. Burckhardt, School of Nursing. It is
not necessary for you to have had a bladder infection to participate
in this project.

It will take approximately 10 minutes of your time to respond to
the questions. You will not be compensated for your efforts and
will not directly benefit from participation in this project, but
your responses will contribute to the knowledge about bladder in-
fections.

Please do not put your name on the questionnaire. By answering the
questions and returning the form you will have given consent for
your answers to be used as part of the project, but your answers
will remain confidential and you will not be identified in any way.

Thank you very much for your contribution to this project. If you
have any questions concerning your participation, you may call Robin
Conner at 225-5040.

1) What is your age? _____

2) Has your doctor ever told you that your bladder does not empty completely? _____

3) Do you have diabetes? _____

4) Have you ever been pregnant? _____

5) Have you ever had any of the following gynecological procedures? (please circle all that apply)
   a) D and C (procedure to clean walls of uterus)
   b) cystoscopy (examination of urine passage tube)
   c) hysterectomy (surgery to remove uterus)
   d) bladder surgery
   e) urinary catheterization (tube inserted to drain urine)
   f) abortion

6) If you circled any of the above, did any of the procedures result in a bladder infection?
   a) no
   b) yes (please list all that apply) _____

7) Have you ever been sexually active? ____

8) How old were you when you first became sexually active?____

9) Are you sexually active now? _____

10) Are your sexual partners men, women, or both?
   a) men
   b) women
   c) both men and women

11) Are you currently pregnant? _____

PLEASE ANSWER QUESTIONS 12-20 AS THEY APPLY TO YOUR CURRENT HABITS AND BEHAVIORS.

12) How many glasses of fluid do you drink in an average day? Include coffee, tea, milk, alcoholic beverages, juice, soda, etc. _____

13) On the average, how many times do you urinate during the day? _____

14) What type of menstrual protection do you currently use?
   a) none
   b) tampons
   c) sanitary napkins
   d) tampons and napkins
   e) other (please describe)

15) What type of birth control do you use?
   a) not sexually active now
   b) IUD
   c) diaphragm
   d) foam or suppository
   e) oral contraceptives "The Pill"
   f) condom "rubber"
   g) condom "rubber" with foam or suppository
   h) natural family planning or rhythm method
   i) sexually active but not using birth control

16) On the average, how long do you wait to urinate after you have sexual intercourse? _____

17) Which description below best describes the way you clean yourself after you go to the bathroom?
   a) front to back (from urine passage tube to rectum)
   b) back to front (from rectum to urine passage tube)
   c) other (please describe)

18) Which description below best describes how tight the pants, jeans or trousers that you usually wear are?
   a) very tight
   b) tight
   c) loose
   d) very loose
   e) never wear pants, jeans or trousers

19) Which description below best describes the type of underwear you wear most frequently?
   a) all cotton
   b) all synthetic
   c) synthetic with cotton crotch

20) Do you currently take bubble baths?

21) Have you ever had a urinary tract (bladder) infection?
_____

**IF YOU ANSWERED "YES" TO QUESTION # 21, PLEASE TAKE A FEW MINUTES TO ANSWER THE REMAINDER OF THE QUESTIONNAIRE.

** IF YOU ANSWERED "NO" TO QUESTION # 21, THE REMAINING QUESTIONS DO NOT APPLY TO YOU. THANK YOU VERY MUCH FOR YOUR PARTICIPATION.

22) How old were you when you had your first bladder infection? _____

23) When was your last bladder infection? _____

24) What kind of symptoms do you have with your bladder infections? Please list all that apply.
_____
_____

25) Do you have any of these symptoms today? Please list __
_____

26) Do your bladder infections occur at any particular time in your menstrual cycle?
a) no
b) yes, during my period
c) yes, one week after my period
d) yes, two weeks after my period
e) yes, three weeks after my period
f) yes, at some other time (please describe)

27) Have you noticed any relationship between sexual activity and bladder infections?
a) no
b) yes, I often have a bladder infection after sexual activity
c) yes, sexual activity often helps my bladder infection go away
d) other (please describe) _____
_____

* THE REMAINING QUESTIONS FOCUS ON HABITS OR BEHAVIORS WHICH OCCURRED IMMEDIATELY PRIOR TO YOUR LAST BLADDER INFECTION. PLEASE ANSWER THE FOLLOWING QUESTIONS AS THEY APPLY TO THE TIME IMMEDIATELY PRIOR TO YOUR LAST INFECTION.

28) Immediately prior to your last bladder infection, how many glasses of fluid did you drink in an average day?_____

29) Immediately prior to your last bladder infection, what type of menstrual protection did you use?
    a) none
    b) tampons
    c) sanitary napkins
    d) tampons and napkins
    e) other (please describe)
    f) cannot remember

30) Immediately prior to your last bladder infection, what type of birth control did you use?
    a) was not sexually active
    b) IUD
    c) diaphragm
    d) foam or suppository
    e) oral contraceptives "The Pill"
    f) condom "rubber"
    g) condom "rubber" with foam or suppository
    h) natural family planning or rhythm method
    i) sexually active but not using contraceptives
    j) cannot remember

31) Were you pregnant at the time of your last bladder infection? _____

32) Immediately prior to your last bladder infection, which description below best described the way you cleaned yourself after you went to the bathroom?
    a) front to back (urine passage tube to rectum)
    b) back to front (rectum to urine passage tube)
    c) other (please describe)
    d) cannot remember

33) Which description below best describes how tight the pants were you wore immediately prior to your last bladder infection?
    a) very tight
    b) tight
    c) loose
    d) very loose
    e) never wore pants, jeans, or trousers
    f) cannot remember

34) Which description below best describes the type of
    underwear you wore immediately prior to your last
    bladder infection?
    a) all cotton
    b) synthetic
    c) synthetic with cotton crotch
    d) cannot remember

35) Did you take bubble baths prior to your last bladder
    infection? _____

36) Prior to your last bladder infection, how long did you
    wait to urinate after having sexual intercourse? _____

37) Please make any comments about your bladder infections
    or health history which you think may be important

    _____

    _____

THANK YOU VERY MUCH FOR TAKING THE TIME TO COMPLETE THIS
QUESTIONNAIRE. YOUR HELP IS APPRECIATED.

APPENDIX C

APPENDIX C

Table C-1
Current Age of Women With
and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	t
Age (years)			
N	38	38	
mean	24.395	29.526	-4.93 *
S.D.	5.196	3.761	

* p < .01

Table C-2

Current Pregnancy In Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
yes	1 (2.63%)	2 (5.26%)	0.59
no	37 (97.36%)	36 (94.73%)	0.60

* p < .01

Table C-3

Past pregnancy In Women
With and Without a Past History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
yes	7 (18.42%)	19 (50%)	3.15 *
no	31 (81.57%)	19 (50%)	3.03 *

* p < .01

Table C-4
Relationship Between the Menstrual Cycle
and the Occurrence of UTI

	Group 2 Previous UTI
N	36
no relationship	32 (88.89%)
UTI during menses	0 (0%)
UTI 1 week post menses	1 (2.78%)
UTI 2 weeks post menses	1 (2.78%)
UTI 3 weeks post menses	0 (0%)
UTI at other time	2 (5.56%)

Table C-5

Past Sexual Activity In Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
yes	31 (81.58%)	38 (100%)	2.98 *
no	7 (18.42%)	0 (0%)	2.90 *

* p < .01

Table C-6

Current Sexual Activity of Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
yes	25 (65.79%)	35 (92.11%)	2.97 *
no	13 (34.21%)	3 (7.89%)	2.96 *

* p < .01

Table C-7

A Comparison of Incomplete Bladder Emptying
In Women With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	37	38	
yes	0 (0%)	2 (5.26%)	1.45
no	37 (100%)	36 (94.74%)	1.45

* p < .01

Table C-8

Diabetes mellitus In Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	38	38	
yes	0 (0%)	0 (0%)	0
no	38 (100%)	38 (100%)	0

* p < .01

Table C-9

Direction of Perineal Cleansing in Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	35	38	
front to back	23 (67.71%)	34 (89.47%)	2.39
back to front	11 (31.43%)	4 (10.53%)	2.3
other	1 (2.86%)	0 (0%)	1.0

* $p < .01$

Table C-10

Use of Bubble Bath by Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	35	37	
yes	15 (42.86%)	18 (48.65%)	.50
no	20 (57.14%)	19 (51.35%)	.51

* $p < .01$

Table C-11

Sexual Preference of Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	31	38	
heterosexual	31 (100%)	38 (100%)	0

* p < .01

Table C-12

Age at Onset of Sexual Activity of Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	t
N	31	38	
mean	18.645	18.421	.27
S.D.	3.104	3.818	
range	14-28	5-28	

* p < .01

Table C-13

Relationship Between UTI and Sexual Activity
Identified By Women With Prior UTI

	Group 2 Previous UTI
N	37
no relationship	20 (54.05%)
sexual activity results in UTI	8 (21.62%)
sexual activity relieves UTI	0 (0%)
other	9 (24.32%)

Table C-14

Relationship Between the Age
at Onset of Sexual Activity
and Age at First UTI

	Age onset sexual activity	Age first UTI	t
N	38	37	
mean	18.421	18.378	-.27
S.D.	3.818	6.093	

* p < .01

Table C-15

Average Daily Fluid Intake (cups)
Of Women With and Without a
Past History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	t
N	37	38	
mean	6.122	6.75	-1.25
S.D.	1.898	2.443	

* p < .01

Table C-16

Average Number of Urinations Per Day In Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	t
N	37	38	
mean	5.703	6.395	0.99
S.D.	3.003	3.045	

* p < .01

Table C-17

Average Time Interval (hours) Between
Intercourse and Voiding In Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	t
N	28	36	
mean	2.021	2.108	-0.11
S.D.	2.976	3.113	

* p < .01

Table C-18

Type of Menstrual Protection Used by Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	35	38	
none	2 (5.71%)	1 (2.63%)	0.66
tampons	10 (28.57%)	14 (36.84%)	0.75
napkins	4 (11.43%)	7 (18.42%)	0.84
tampons/ napkins	19 (54.29%)	16 (42.11%)	0.85

* p < .01

Table C-19

Tightness of Clothing Worn by Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	36	38	
tight/ very tight	9 (25%)	9 (23.68%)	0.13
loose/ very loose	25 (69.4)	28 (73.68%)	0.41
other	2 (5.56%)	1 (2.63%)	0.65

* p < .01

Table C-20

Type of Underwear Worn by Women
With and Without a Prior History of UTI

	Group 1 No previous UTI	Group 2 Previous UTI	z
N	36	38	
cotton	14 (38.89%)	20 (52.63%)	1.19
synthetic	0 (0%)	1 (2.63%)	1.00
synthetic/ cotton crotch	22 (61.11%)	16 (42.11%)	1.66
other	0 (0%)	1 (2.63%)	1.00

* p < .01

APPENDIX D

APPENDIX D

COMPARISONS OF PAST AND CURRENT BEHAVIORS
OF WOMEN WITH A PAST HISTORY OF UTI

Table D-1

<u>Comparison</u> <u>of</u> <u>Current</u> <u>Fluid</u> <u>Intake</u> <u>(cups)</u>
<u>To</u> <u>Fluid</u> <u>Intake</u> <u>Prior</u> <u>to</u> <u>Last</u> <u>UTI</u>

	<u>Past</u>	<u>Current</u>	<u>t</u>
N	33	38	
mean	6.455	6.75	-0.83
S.D.	2.184	2.443	

* $p < .01$

Table D-2

<u>Comparison</u> <u>of</u> <u>Contraceptive</u> <u>Method</u> <u>Used</u>
<u>Currently</u> <u>and</u> <u>Prior</u> <u>to</u> <u>Last</u> <u>UTI</u>

	Past	Current	<u>z</u>
N	33	37	
IUD	3 (9.09%)	0 (0%)	1.8
diaphragm	11 (33.33%)	8 (21.62%)	1.1
foam	1 (3.03%)	0 (0%)	1.02
oc [a]	10 (30.30%)	12 (32.43%)	0.17
condom	2 (6.06%)	6 (16.22%)	1.38
none	3 (9.09%)	6 (16.22%)	0.90
tubal	1 (3.03%)	3 (8.11%)	0.94
vasectomy	2 (6.06%)	2 (5.41%)	0.12

* $p < .01$
[a] oral contraceptives

Table D-3

Comparison of Direction of Perineal Cleansing
Currently and Prior to Last UTI

	Past	Current	z
N	37	38	
front/back	30 (81.08%)	34 (89.47%)	0.97
back/front	4 (10.81%)	4 (10.53%)	0.04
can't recall	3 (8.11%)	NA	

* p < .01

Table D-4

Comparison of Current and Past
Interval (hours) Between Intercourse and
Voiding in Women With Prior UTI

	Past	Current	t
N	26	36	
mean	1.503	2.108	0.18
S.D.	2.252	2.113	

* p < .01

Table D-5

Comparison of Use of Bubble Bath
Currently and Prior to Last UTI

	Past	Current	z
N	37	37	
yes	14 (37.84%)	18 (48.65%)	0.95
no	23 (62.16%)	19 (51.35%)	0.95

* p < .01

Table D-6

Comparison of Tightness of Clothing
Currently and Prior to Last UTI

	Past	Current	z
N	37	38	
tight/ very tight	12 (32.43%)	9 (23.68%)	0.81
loose/ very loose	21 (56.76%)	28 (73.68%)	1.56
none	1 (2.7%)	1 (2.63%)	0.27
can't recall	3 (8.11%)	NA	

* p < .01

Table D-7

<u>Comparison</u> <u>of</u> <u>Type</u> <u>of</u> <u>Underwear</u> <u>Worn</u>
<u>Currently</u> <u>and</u> <u>Prior</u> <u>to</u> <u>Last</u> <u>UTI</u>

	<u>Past</u>	<u>Current</u>	<u>z</u>
N	38	38	
cotton	14 (36.84%)	20 (52.63%)	1.4
synthetic	3 (7.89%)	1 (2.63%)	1.08
synthetic/ cotton	17 (44.74%)	16 (42.11%)	0.19
none	1 (2.63%)	1 (2.63%)	0.0
can't recall	3 (7.89%)	NA	

* <u>p</u> < .01

APPENDIX E

APPENDIX E

CHARACTERISTICS OF URINARY TRACT INFECTIONS
AS REPORTED BY WOMEN WITH A PRIOR HISTORY OF UTI

Symptoms Associated With UTI

Subjects who reported a past history of UTI were asked to describe the symptoms that occurred with UTI. Table E-1 lists the symptoms and the frequency each response occurred. The 38 subjects gave a total of 103 responses. The number of responses for each individual ranged from 1 to 5.

Table E-1
Symptoms associated with UTI

SYMPTOM	FREQUENCY
Burning with urination	26
Urinary frequency	24
Pain	19
Urgency	11
Hematuria	4
Urinate small amounts	3
Can't urinate	3
Pelvic cramping/pressure	3
Itching	2
Chills	1
Backache	1
Stinging	1
Flank pain	1
Fullness	1
Clear urine	1

The last item of the questionnaire asked subjects to make any comments about their past urinary tract infections which they considered to be important. The subject's responses to this open-ended question were categorized into six groups based on the content of the response. The six categories were behaviors, sexual intercourse, pregnancy, use of a diaphragm, menses, and congenital/anatomical factors. The comments in each of the six categories follow.

Behaviors

"I've had them so often! Surprised this questionnaire didn't mention different types of toilet tissue, very plain, unscented is supposed to be helpful in that it irritates less."

"Soaking at Bagby (Hot Springs) prior to last infection."

"It was during college when I did not take enough fluids in."

"Traveling in foreign country, used a hotel bidet."

Sexual intercourse

"Currently take 25 mg of Macrodantin after intercourse to prevent UTI. Have not had any UTIs if I remember to take the Macrodantin after intercourse. I have had a history of 40-50 UTIs over the past 15 years, but have never had one that did not occur after intercourse."

"My bladder infections occurred only after sex- Not always after sex- However if I had intercourse three or more times in one hour without interruption (not having a chance to urinate) I could count on having a bladder infection. Also if any anal intercourse occurred (even when not penetrating the vagina again until bathing) I would also get a bladder infection. The only way to prevent a bladder infection was to urinate frequently

during sex and that didn't always work."

"When having sex, if I take the top position and I'm dry, I tend to start having signs of a bladder infection, when I'm dehydrated, summertime."

"When my sexual activity increases, I am more prone to infections."

Pregnancy

"They occurred frequently while pregnant, none since delivery."

"Presently with cystocele, but no bladder infections since pregnancy."

Diaphragm

"No bladder infections after size of diaphragm was decreased."

"Only have had one bladder infection. It was after changing contraceptive gel with diaphragm to cream which was runnier. After changing back to gel did not have any problems even when not urinating until several hours after intercourse."

Menses

"Seems week before period, urination slows down, same with feces, I get constipated. The week before, everything seems to back up."

Congenital/anatomical factors

"Early bladder infections from urethra too small."

"Congenital urethral meatal stenosis repaired with meotomy x 1 and dilatation x2 at 3-5 years old. Abnormal holding capacity of bladder- 250 cc."

AN ABSTRACT OF THE THESIS OF

Robin Meeuwsen Conner

For the MASTER OF NURSING

Date of Receiving this Degree: June 12, 1987

TITLE: HABITS AND BEHAVIORS ASSOCIATED WITH
URI███████████████████████████WOMEN

Approved ████████████████████████████
Ca███████████████████████ Advisor

Each year, 3% of women in the United States seek medical treatment for urinary tract infection (Vital and Health Statistics, 1982). These infections cause pain, discomfort, and interference with ability to function in an given role, and may cause serious renal damage (Cook and Takiff, 1982). This study was conducted to identify factors which may be associated with the development of urinary tract infections in young women.

Seventy-six women, ages 18-35, 38 with a prior self-reported history of UTI and 38 without a prior self-reported history of UTI were recruited in a large metropolitan area. Participants completed a 37 item self-administered written questionnaire which gathered information on factors commonly thought to be associated with UTI. These factors included physiological factors (age and pregnancy), pathophysiological factors (diabetes mellitus, incomplete bladder emptying, and urogenital instrumentation) and behavioral factors (sexual activity and sexual preference, type of menstrual protection and contraception used, perineal hygiene, fluid intake, number of urinations per day, time interval between sexual activity and voiding, tightness of clothing and type of underwear worn, and use of bubble bath. The subjects with a prior history of UTI were surveyed to determine whether their behavior immediately preceding their last UTI differed from their current behavior.

The following relationships were revealed when addressing the research questions generated for this study.

1. The subjects with a prior history of UTI were more likely to be older ($\underline{t}$ = 4.93, $\underline{p}$ < .01), be currently sexually active ($\underline{z}$ = 2.98, $\underline{p}$ < 0.01) and have been sexually active in the past ($\underline{p}$ < 0.01, $\underline{z}$ = 2.97), use condoms for contraception ($\underline{z}$ = 2.68, $\underline{p}$ < .01) have been pregnant ($\underline{z}$ = 3.15, $\underline{p}$ < .01), and have undergone urogenital instrumentation ($\underline{z}$ = 3.3, $\underline{p}$ < 01) than women without a past history of UTI.

2. There were no differences between groups in the

following factors: current pregnancy, diabetes, incomplete bladder emptying, perineal hygiene, sexual preference, fluid intake, number of urinations per day, type of menstrual protection used, time interval between sexual activity and voiding, tightness of clothing, type of underwear worn, or use of bubble bath.

     3. Among subjects with a prior history of UTI, there was a statistically significant decrease between current and past behavior in use of tampons for menstrual protection. There were no other statistically significant differences in behavior immediately preceding their last UTI and current behaviors in fluid intake, type of contraception, pregnancy, perineal hygiene, time interval between sexual intercourse and voiding, tighness of clothing, type of underwear, and use of bubble bath.

     4. Among subjects with a prior UTI, there was no relationship between the time of the menstrual cycle and occurrence of UTI. Approximately one-half of subjects reported that UTI was often or always preceded by sexual intercourse.

     The majority of the statistically significant findings in this study were physiological and pathophysiological factors. Nursing intervention may not affect these factors. Behavioral factors which were found to be associated with UTI in other studies were not found to be associated with UTI in this study. The implications for nursing practice include comparison of the clinical population of interest to this study sample before applying the findings of this study. A convenience sample and use of recall data were limitations of this study. Future studies should focus on a random, stratified sample and should make use of a subject diary to prospectively study subject behaviors.