Pyuria in Children

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Volume VII | Thursday, February 13, 1936 | Number 16

UNIVERSITY OF MINNESOTA HOSPITALS
Volume VII Thursday, February 13, 1936 Number 16

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PYURIA IN CHILDREN

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Pyuria is the most important sign of urogenital disease in children. Gäppert, Helmholz and Amberg found that pyuria constituted about 1% of all cases encountered in private pediatric practice.

Types

Acute pyuria constitutes the greater majority of the cases. They are the so-called cases of acute pyelitis, cystitis and pyelonephritis. It occurs nearly 9 times as frequently in girls as in boys. It is usually a bacillary infection. Fortunately, most of these yield to simple medical treatment and clear up entirely within 4 to 6 weeks.

Chronic pyuria: Pyuria persisting longer than 4 to 6 weeks is considered to be chronic. Urinary stasis is the principle predisposing cause and in children is predominately due to congenital anomalies. In private practice, only about 6% of cases become chronic.

Age and Sex

Campbell's series of 402 cases: 292 girls and 110 boys.

Age of patients	No. of Cases
Under 3 months	15
3 to 7 months	15
7 to 12 months	42
13 to 36 months	80
4 to 6 years	97
7 to 10 years	119
11 to 15 years	34

Significance of Pus in the Urine

"One frequently hears the remark that there is a small amount of pus in the urine but not enough to mean anything." A review of the literature gives the same impression.

Eisendrath says that one finds 5 to 7 leucocytes to the high dry field in the urine of normal children.

Jarrell, in an article on pyelitis in infancy, says that if there are as many as 10 leucocytes to the field a diagnosis of pyelitis may be made.

Helmholz feels that the presence of a small amount of pus in the urine has been over-emphasized. He gives a normal in the uncentrifuged urine from boys obtained with ordinary precaution, 2 to 3 pus cells per low power field, and in the urine from girls, not more than 6 to 8 cells. He does not state the basis for these figures.

To confirm or refute these assumptions, all patients admitted to the Children's Orthopedic Hospital, Seattle, for a period of ten months (March 1931 to January 1932) were studied. There were 694 children admitted (400 boys and 294 girls), ranging in age from 24 hours to 16 years. The study was reported by Hepler and Scott. The following chart is a summary of the results found.

	Voided		Catheterized	
	Centrifuged	Uncentrifuged	Centrifuged	Uncentrifuged
Less than 1 per high power field	272	148	34	27
1 to 5 per high power field	324	73	39	18
5 to 10 " " " "	52	12	11	10
10 to 20 " " " "	26	10	8	7
Over 20 " " " "	13	3	7	2
TOTALS	687	246	99	64
Percentage: Positive	99%	36%	13%	9%

"While there were 687 children with pus in the voided urine, only 99 had it in the catheterized specimen. Therefore, catheterization is imperative in urinary diagnosis."

They agree that the sediment of urine should be studied uncentrifuged. "So many variable factors are introduced by centrifugation, such as time and rate of spinning and method of collecting the sediment, that it is of no value in a quantitative estimation of pus.

These patients were all carefully checked for urinary symptoms, either past or present, and, if positive, the child was observed or a complete renal study was made. They concluded, "The amount of pus in a urine properly collected is no indication either of the kind or of the severity of urinary tract disease. In 24 children in this group with demonstrable urinary tract disease, exactly similar lesions existed with pus counts that varied from less than 1 per high dry field to more than 20 per high dry field. Fifty per-cent of the children with demonstrable urinary tract disease and a number with advanced lesions and severe infection had pus in amounts well under what is frequently set forth as a normal count."

Etiology

1. Bacterial: The colon bacillus is the usual offending organism, although others and mixed infections are occasionally found.

From a series of 109 cases studied by Summerfeldt, Johnston and Kaake, we have the following table:

Microorganisms Isolated from Urine (Catheterized Specimens):

	Acute Pyuria		Persistent Pyuria	
	No. of strains	Hem. strains	No. of strains	Hem. strains
Culture				
B. coli	15	2	8	0
B. coli communior	27	3	11	6
B. cloacae	1	0	0	0
B. aerogenes	1	0	0	0
B. oxycoccus perniciosus	1	1	0	0
B. coli unclassified	19	1	4	0
B. paracoli	10	1	1	1
B. Morgani	3	0	0	0
Fecalis alcaligenes	2	0	0	0
Proleolytic bacilli	6	2	2	0
B. pyocaneus	2	1	0	0
B. asiaticus	2		1	
B. dysenteriae Flexner	2		1	
B. dysenteriae Schmitz	2		1	
B. Dysenteriae Sonne	1		0	
Staphylococcus aureus	7		0	
Staphylococcus albus	0		0	
Staphylococcus sp.	0		2	
Diphtheroid	1		0	
Streptococcus fecalis	0		0	
Streptococcus hemolyticus	0		2	
Unidentified	1		1	

Summary: colon types 79, dysentery groups 8, coccus groups 9, others 8.

Note: In our own experience, the percentage of coccus infection (mixed) is much higher. The routine use of semi-anaerobic media may account for this difference.

2. Urinary Tract Lesions: "It has been shown that with the exception of prostatic hypertrophy and carcinoma every lesion which occurs in adults may be found in children." "At autopsy, congenital anomalies of the urinary tract have been found in 2% of cases."

"Investigation has shown that the great majority of cases of chronic pyuria are due to inadequate drainage due to an obstruction of the urinary tract."

Location	No. Cases	Cause
At ureterovesical orifice	15	Partial stenosis
At pelvoureteral junction	5	" "
At 1 to 1½ inches below pelvic brim	4	Aberrant vessels
At pelvic brim	3	Fibrous bands
Below pelvic brim	1	Partial stenosis
Other places in ureter	6	Double ureter
In urethra	1	Membranous urethra

Types of obstruction found at different sites (with pyuria): 23 cases studied by Summerfeldt and Brown.

"It is important to remember that lesions causing urinary stasis may be present for years without infection or pyuria. Bigler found 50% of children with urinary stasis did not have pyuria. However, when infection does take place, it is exceedingly persistent."

Symptoms

Symptoms are so variable it is impossible to describe a typical case. They vary with age and the severity of the particular attack. In the very young patients, the symptoms are largely constitutional and in older patients local phenomena are more apt to be present.

Acute

Fever: Most frequent symptom in infancy. Often, it is the only one present. There is often a sudden initial rise which may be maintained at a level or show marked daily fluctuations. Rectal temperature may rise to 105 or 106.

Chill: often seen in children of school age.

Vomiting: frequent at onset of illness but seldom lasts more than 2 or 3 days.

Nervous symptoms: infants may have convulsions at onset. Delirium, twitching and meningismus are often present and may require spinal puncture. (See our cases).

Abdominal symptoms: occur frequently but on the whole are vague. In older children, may resemble renal calculus. The pain is referred along the ureter, with burning and frequency of micturition.

Pallor: is seen at onset but anemia is uncommon except in cases of long standing.

Anorexia and prostration: are usually present.

Chronic

Campbell reports the chief urinary and non-urinary tract complaints of 402 cases of chronic pyuria on admission to the hospital.

Symptoms

Urinary Complaints

Frequency	286
Pyuria (grossly cloudy urine)	255
Dysuria	218
Fever	198
Pain	153
abdominal (52)	
loin (49)	
bladder (42)	
Hematuria	73
Enuresis	34
Urgency	34
Nocturia	30
Urinary burning	27
Bladder spasm	15
Incontinence	13
Painful urination	12
Chronic retention	12
Acute retention	4
Hesitancy	4
Mass in loin	2

Non-urinary Complaints

Gastro-intestinal upsets as:

Nausea, vomiting, constipation, diarrhea	199
Weight loss	36
Sinus trouble	28
Headache	25
Ear trouble	21
Cough	16
Bronchitis	16
Diarrhea	15
Sore throat	13
Stuporous	9
"Influenza"	7
Tires easily	7
Paralysis of legs	4
Fecaluria	2
Respiratory difficulty	1

Diagnosis

"The physical examination of the patient with uncomplicated pyuria brings forth no characteristic findings, but, it is just this lack of findings that should suggest pyuria."

The diagnosis is usually confirmed by urinalysis. When pus cells are discovered in the urine, it is first necessary to determine whether or not they signify a urinary infection. A vulvitis or vaginitis so slight as to escape notice may account for the pus. "Not every specimen in a case of pyuria shows increase of cells. They may be absent or occur only in small numbers for a period of several days." Tuberculosis, foreign bodies and stones must be ruled out.

Collection of urine specimens

Repeated catheterizations for the numerous specimens examined in following a case of pyuria is not always to be recommended. The following precautions and methods have been used.

Males: "It is sufficient to cleanse the glans with antiseptic solutions." The first few c.c. voided are discarded and the rest collected.

Infant males: "Penis is inserted into a test tube and this is attached to the infant with adhesive plaster." Oftentimes to prevent irritation from the test tube arrangement, the penis is first placed in a finger cot which has a small opening in the end.

Females: Contamination from the urethra and vagina must be avoided by careful cleansing of the genitalia.

Infant females: The best receptacle is a small china seed jar sold for canary bird cages. These can be applied between the infant's thighs and enclosed in the diaper without other fastenings.

Urine culture

"Helmholz has emphasized the fact that unless a culture of the urine is made, the physician will never know when the patient is cured, i.e. when the urine is sterile.

Media

1. Litmus lactose agar - furnishes quick information on organisms of colon group.

2. Blood agar plates - furnish information on coccus family." (Media used at the University of Minnesota Hospitals: blood agar plates, liver peptone and eosin methylene blue plates.)

"Bacteria can be grown from the urine in a certain percentage of healthy children, especially infants, but these are usually present only in small numbers. In typhoid and paratyphoid fever and occasionally in other infections, a true bacteruria may occur without the presence of pus."

Campbell reports albumin in 334 of his 402 cases.

2 hr. P.S.P. (Intramuscularly)	Cases
Less than 5%	7
5 to 10%	7
11 to 20%	19
21 to 35%	44
Over 50%	83
Lowest	48
Highest	0
	80

Nonprotein nitrogen Mgm. per 100 cc. of blood	Cases
Under 30	140
31 to 45	134
46 to 60	17
Over 60	16
Lowest	22
Highest	228

Radiographic Examination

Especially indicated in chronic cases.

1. Plain ray of urinary tract for stone or spinal defect.

2. Intravenous urography:

"At first, uroselectan was used, but now the more concentrated preparations (diadrast and neoskiodan) are used. It has been found that a child of 2 years of age and over will tolerate from 15 to 20 cc. or practically the amount recommended for injection in the adult. So far, there have been no harmful reactions to these larger doses. When using the recommended dosage of 2 to 3 cc. in children under 2 years of age, visualization has been very poor because of the poor concentration of the drug in the urinary tract.

"In younger children and infants, intestinal gas frequently obscures the urinary shadow. It is advisable to examine the abdomen under the fluoroscope and to postpone the taking of urograms if much gas is present. Enemata are best avoided as they increase rather than decrease the amount of gas in the bowel. The administration of pituitrin is of no value in removing gas. The use of a compression band about the abdomen causes the kidney pelves to become well filled and more readily visualized but prevents visualization of the ureters. A second film taken immediately after the removal of the band may show the ureter well filled."

"Schwenther has shown that with careful technique good results are obtained in only 35% of infants under 2 years of age, but in 65% of children above that age.

Cystoscopic examination

"Whenever adequate data are not obtained by radiographic examination, one should not hesitate to subject children to cystoscopy and ureteral catheterization with the taking of retrograde pyelograms and the study of the ureteral urines.

Treatment

Fluids: "In many cases, large amounts of fluid are the only form of therapy necessary or desirable." If vomiting occurs, fluid may be given rectally, subcutaneously, intraperitoneally, intramuscularly or intravenously:

For infants up to 3 months of age - 1000 to 1500 cc. per day

For children over 1 year of age - 2000 cc. per day

Older children - as much in excess as they will take.

"In anuric cases, Helmholz uses 20% solution of sucrose intravenously, 2 cc. per minute until 5 cc. for each kilogram body weight has been given.

Effect of changes in the pH of the urine

"Shahl and Janney show that the growth of colon bacilli is inhibited at the acid limit of pH 4.6 to 5.0 and at the alkaline limit of pH 9.2 to 9.6. As a range of pH 5.4 to 8.4 can be attained in the urine by the administration of acid forming or alkaline forming salts, it is impossible to render the urine either bactericidal or bacteriostatic by a change in pH. However, good results have been reported in the treatment of pyelitis by shifting the reaction of the urine back and forth from acid to alkaline.

"Holmholz and Millikin studied the effect on growth of transferring the colon bacillus and staphylococcus from an acid to an alkaline medium and vice versa. They found that a shift from acid (5.4) to alkaline (8.4) favored the growth of the colon bacillus, while a shift from alkaline to acid retarded the growth for as long as 6 hours. They state that Staphylococcus aureus grows better in an alkaline than acid medium and that it would seem possible that sufficient urinary acidity might be produced to inhibit its growth."

Alkalinization of urine

"Recommended by most pediatricians on a strictly clinical basis without any evidence that it influences the infection beneficially more than the same amount of fluid without alkalinization." "It is impossible to make urine

sufficiently alkaline to interfere with the growth of the colon bacillus so it is thought where alkalinization alone is used that the action must be upon the tissue rather than the organism."

Litmus paper is used as the indicator.

The best alkali for ordinary use is sodium bicarbonate gr. V and sodium citrate gr. V. per dose dissolved in water and given 5 to 6 times a day, increasing the dose if needed.

"If vomiting is present, alkalosis may develop and must be guarded against."

Improvement usually occurs in 3 days in mild cases.

Acidification of urine

"Of value in some cases, especially where changes are made from highly alkaline to highly acid reactions. It is seldom necessary to use much acidifying substance because the urine usually is highly acid."

Drugs most frequently used:

1. Ammonium chloride, gr. XV q.i.d. to child of 7.

2. Ammonium chloride, gr. VII q.i.d. to an infant.

"Although ammonium chloride may cause some lowering of the CO_2 combining power of the blood, clinical acidosis rarely occurs."

3. Sodium acid phosphate, gr. V to gr. X. q.i.d. To infants, this may cause diarrhea.

4. Ammonium nitrate, gr. VII to gr. XV, often used.

Urinary Antiseptics

"Methenamine (urotropin) itself is believed by most workers to have no antiseptic properties, but, its effect is due to its decomposition into formaldehyde in acid media."

"Shohl and Deming showed whereas 20% of methenamine adminstered was converted to formaldehyde in urine pH 5.0, only 3% was converted at pH 6.4 and none at pH 7.6."

"The administration of 7.5 to 15 grains of methenamine t.i.d. may lead to a 1 : 6000 concentration of formaldehyde in the urine, provided the urine is kept sufficiently acid and the patient's fluid intake is restricted."

"Vermooten and Berry found that concentrations are great as 1: 3000 are bacteriostatic rather than bactericidal."

"The dose of methenamine for infants is 1 to 3 grains t.i.d. For older children, 5 to 7.5 grains t.i.d or q.i.d. In addition, ammonium chloride 15 grains q.i.d. should be administered to render the urine acid to a pH 5.5 to 5.0."

"The pH of urine may be determined by one of the ordinary colorimetric procedures. Osterberg and Helmholz suggest the simple method of testing with filter paper soaked in a 0.04% aqueous solution of chlorphenol red and then dried. If this test paper remains yellow and does not turn red, the pH is less than 5.5" A small piece of this paper can be placed in the infant's diaper and the pH watched without collection.

"The urine should be examined daily for the presence of hematuria, which occurs in some individuals when giving methenamine. Helmholz states that hematuria is due to hemorrhage from the bladder and not to renal irritation, and is of no serious import. When hematuria occurs, methenamine should be discontinued and alkali administered."

The occurrence of severe gastric symptoms may also prevent the continuation of treatment.

Helmholz advises "to give the methenamine and ammonium chloride for 3 days. Then culture the urine on agar plates. If organisms are still present, increase the dose of methenamine from 5 to 7.5 grains for 2 days and culture urine again. If organisms are still present, increase the dose. Continue this

until urine is sterile or irritation of bladder produced by formaldehyde necessitates discontinuing the therapy temporarily."

"If the urine culture is negative, the medication is continued for 2 days and another culture is made. If this is negative, the medication is discontinued after 3 days. Then, if the culture is negative, the infection has cleared. If not sterile, the procedure may be repeated."

Hexylresorcinol

"Was introduced as a urinary antiseptic by Leonard who claimed that its germicical action depended upon its ability to alter the surface tension of the urine. In order that this effect may not be interfered with, it is desirable to restrict the intake of fluid and withhold the use of alkalis.

"Hexylresorcinol is administered to children in capsules or in oil (caprokal) in a dose beginning with 0.15 grams t.i.d. and increasing to .6 or .9 grams t.i.d. Occasionally, a gastro-intestinal disturbance or troublesome dermatitis follows the use of the drug."

"It has been claimed that infections with staphylococci respond rapidly to treatment with hexylresorcinol, while those with B. coli are more resistant. On careful analysis of cases reported, it is found that in uncomplicated chronic pyelitis, only 25% cures were obtained -- a result which is not superior to other methods of treatment."

"On the other hand, Helmholz and others have found hexylresorcinol of no value in the pyelitis of childhood."

Mercurochrome

"Occasional fatal results have been reported after intravenous mercurochrome and the drug has not been used very extensively in children. There has been considerable disagreement on the clinical results. Helmholz has found it to be of no value in the pyelitis of children.

Acriflavine, pyridium and serenium

"These are all dye substances administered by mouth and excreted through the urine and are claimed to render the urine antiseptic."

Acriflavine: "Dose is 0.025 to .05 grams by mouth b.i.d to t.i.d. It is essential that the urine should be rendered alkaline by giving sodium bicarbonate." Davis and Sharp report 50 to 75% of the urine specimens excreted after the administration of acriflavine are bactericidal to B. coli and staphylococcus. "There is considerable disagreement in regard to its therapeutic efficiency."

Pyridium: "is excreted in high concentration by the kidneys but Gillespie believes the doses recommended have no bactericidal effect."

Neoarsphenamine

"Porges first observed the clearing of the urinary infection after the intravenous injection of neoarsphenamine in a tabetic patient. The therapeutic effect was considered to be due to the splitting off of formaldehyde in the urine."

"It was observed that staphylococcus infections in many instances responded readily to neoarsphenamine, while colon infections did not. Between 1919 and 1923, favorable results were reported and success with neoarsphenamine treatment in staphylococcic infection has been mentioned repeatedly in the urological literature but it has been discussed only rarely in pediatric literature."

"The dose of neoarsphenamine which generally has been used is 2.5 to 5 mg. per kilogram repeated at intervals of 3 to 5 days. Usually, 2 to 6 doses suffice for the sterilization of the urine. The treatment of infections associated with calculi or urinary obstruction was unsatisfactory.

Ketogenic diet

"In 1931, Helmholz and Clark introduced the ketogenic diet in the treatment of pyuria. Its use was suggested by the fact that the ketone loaded urines of epileptic patients receiving the diet remained free of bacteria on standing in the laboratory."

"Helmholz showed that the antiseptic property of the urine was not due to its acidity alone nor to the presence of diacetic acid and concluded that it was due to some unidentified substance."

"Fuller identified the bacterial inhibitory factor as levarotary betahydroxybutyric acid. He determined the effective concentration of this substance and confirmed Holmholz observation that it varied with the acidity of the urine. The minimum standards which must be met in order that the urine may be bacteriostatic are a urinary pH of 5.5 or less and a concentration of betahydroxybutyric acid of 0.5% or greater."

In a ketogenic diet, the essential feature is a high proportion of fat in relation to carbohydrate and protein. This ratio is simply expressed as:

$$\frac{\text{Grams of fat}}{\text{Grams of carbohydrate + Grams of protein}}$$

F : C + P

"To obtain a high degree of ketosis a F : C + P ratio of 4 : 1 is usually advisable at the beginning and at times it is necessary to increase the ratio 5 : 1 or 6 : 1.

The following is a regimen which is usually sufficient to insure ketosis. Patient is given 50 calories and 1 gram of protein per kilogram body weight.

(For a child weighing 30 kg. -- 1500 calories)

Being with	carbohydrate	70	grams,	protein	30	grams,	and	fat	120	grams.
2d day	"	50	"	"	30	"	"	"	131	"
3d day	"	30	"	"	30	"	"	"	140	"
4th day	"	20	"	"	30	"	"	"	144	"
5th day	"	15	"	"	30	"	"	"	146	"
6th day	"	10	"	"	30	"	"	"	148	"

"Since the diet need be continued only for a few weeks, it is well to give the patient less than the full caloric requirement in order to prevent anorexia.

"It is important to test the urine frequently." The pH is tested simply by chlorphenol red paper. There is no simple test for betahydroxybutyric acid." However, Osterberg and Helmholz have shown that there is a fairly constant ratio between the concentration of diacetic acid and betahydroxybutyric acid. They have adapted the Rothera diacetic test for a simple colorimetric method of determining whether or not the concentration of betahydroxybutyric acid is greater or less than 0.5%.

"When the urine cannot be brought to the proper degree of acidity by the use of the ketogenic diet alone, ammonium chloride should be given in doses sufficient to maintain a low pH.

"The results of the ketogenic diet have been uniformly favorable. Most patients treated have had urinary infections of long duration, in some instances as long as 10 years. Many have failed to receive benefit from urinary antiseptics and other methods of treatment. In most instances, the patients selected have had chronic infections not associated with any demonstrable abnormality of the urinary tract. However, Helmholz has reported cures of 3 children having hydronephrosis (one with double ureters)."

"The average length of time before sterile cultures were obtained was 10 to 15 days." In one instance of a 3 year old girl, the urine was sterile after 7 meals and the ratio was only 2 : 1. "Cure rarely results after 3 weeks, although there are some instances of a successful outcome after 6 to 7 weeks. There seems to be a tendency for the antiseptic property of the ketone urine to wear off after 2 to 3 weeks. Especially has this been observed in adults. It seems that the tendency is for the body to adjust itself to the abnormal metabolism."

"The results of all workers indicate that when one can exclude an anatomical urological lesion, cure may be expected in 60 to 70% of cases."

The causes of failure to respond to the ketogenic regime are summarized by Wilkins as follows:

"1. Failure of the patient to cooperate in following the diet or to continue it long enough.

2. The failure of ketone urine to develop. This is more apt to result in adults than in children.

3. Lack of a sufficient degree of acidity of the urine. The pH should be tested and, if necessary, ammonium chloride should be administered to render the pH less than 5.5.

4. Poor renal function, as in chronic pyelonephritis and hydronephrosis. This may interfere with the excretion of the ketones through one or both kidneys.

5. The increased resistance of certain bacteria to germicidal agents. Clark states that aerobacter aerogenes is 10 to 20 times as resistant as E. coli. Cook and Helmholz differ from this opinion and believe that each organism responds equally well to the lowered pH and the bactericidal properties of the diet."

"The ketogenic diet is not indicated for the treatment of the acute case, which os often responds rapidly to simple diuresis and alkalinization. Before its use in the more chronic cases, urinary tract abnormalities should be searched for and corrected if present. If sterilization of the urine has been accomplished first by the ketogenic diet, the urological examination should still be made, since it is possible that ketogenic diet may clear up an infection even in the presence of abnormalities.

Unsuccessful results

According to Wilkins: The end result of uncured pyuria is destruction of the kidney parenchyma. The presence of obstruction may lead to pyonephrosis or hydronephrosis through back pressure. Without obstruction, the infection of the kidney may lead to contracted pyelonephritic kidney causing a clinical picture similar to chronic interstitial nephritis.

Summary

1. Pyuria constitutes 1% of private pediatric cases; 6% of these become chronic.

2. It is more frequent in girls (9-1).

3. The amount of pus in a urine properly collected is no indication either of the variety or the severity of the urinary tract disease.

4. In every case of pyuria, it is important to determine the infecting organism by means of cultures of the catheterized urine. The colon bacillus isthe most frequent organism found.

5. If a patient's urine does not

become sterile in 4 to 6 weeks, or if relapses occur, a thorough urological examination is demanded (radiographic and cystoscopic).

6. Symptoms are so variable it is impossible to describe a typical case. The lack of physical findings should suggest pyuria.

7. Diagnosis is usually confirmed by a urinalysis of one or more carefully collected specimens and culture of catheterized specimens. Tuberculosis, foreign bodies and stones must be ruled out in every instance.

8. "An acute pyuria should be treated medically for 4 to 6 weeks, unless a urinary abnormality is obviously indicated by a palpable kidney or bladder mass, urinary colic, hematuria or symptoms of urinary retention. The treatment of choice is forcing fluids and alkalinization (?) (ours) of the urine. If there is no improvement after 2 to 3 weeks, urinary antiseptics or the ketogenic diet may be given a brief trial." Acidification is seldom necessary.

9. "No case of pyuria should be considered cured until the urine has been proved sterile by at least two negative cultures and stains of the sediment." (Helmholz).

10. In a certain proportion of chronic infections, no abnormality of the urinary tract is found. These cases must be treated by urinary antiseptics or the ketogenic diet.

11. "The urinary antiseptics have not proved very effective especially against the colon group of bacilli, which cause most of the infections." There is a wide difference of opinion in regard to the relative value of the different drugs. In spite of the introduction of new antiseptics, methenamine is still the most widely favored. Neoarsphenamine is of value in adults (?) but not much used in children.

12. The ketogenic diet seems to be more effective against bacillary infections than any antiseptic drug. Sterilization of urine has been obtained in 60 to 70% of cases treated. The causes of failure are recorded.

13. The minimal requirements for successful results with ketogenic diet are a concentration of 0.5% of beta-hydroxybutyric acid in the urine and a urine acidity less than pH 5.5.

14. The end result of uncured recurrent pyuria may be kidney destruction.

15. Illustrative cases of acute and recurrent forms follow.

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III. CASE REPORT

ACUTE PYURIA

., white female, aged 3 months.

Admitted 11-10-35 and discharged 12-16-35 (16 days).

Onset

11-25-35 - Upper respiratory infection with rhinitis.

Change

11-30-35 - Chill, "shook all over," "almost a convulsion." Temperature 104. Several loose bowel movements and vomited once or twice that day. Very restless and irritable since this time.

Past History

Spontaneous normal delivery at 9 months. Birth weight 6 lbs. 11.5 oz. No previous illnesses. Diet: Lactic acid milk formula, 5 times a day every 4 hours. Cod liver oil and orange juice.

Admitted

11-10-35 - Physical examination: Temperature 98. Pale, but well nourished, aged 3 months. Weight 5350 grams. Head - neck rigid; eyes, ears, nose and throat - no evidence of infection. Chest - slight dulness in right posterior lung area; no rales. Abdomen - negative. Kernig - positive.

Differential diagnosis:

1. Pyuria.
2. Pneumonia.
3. Meningitis.

Laboratory

Urine - acid reaction, occasional cloud of albumin, white blood cells 30 to 40 per high power field (catheterized); culture - micrococcus. Blood (admission) - hemoglobin 60%, red blood cells, 2,860,000, white blood cells 41,000, neutrophils 71%, lymphocytes 28%, mononuclears 1%; (discharge) - hemoglobin 55%, white blood cells 18,000, neutrophils 70%, lymphocytes 30%. Wassermann - negative. Spinal fluid - normal. X-rays: Chest - negative; Kidneys, ureters and bladder - kidneys not visualized due to too large amount of gas in intestines.

Course

11-30-35 - On day of admission, temperature rose from 98 to 106. Spinal puncture done. Acetylsalicylic acid, grains II, given.

12-1-35 - 2 A.M., temperature fell to 96; 6 A.M., rose to 104.

Temperature fluctuated between 103 and 102 for 5 days, then went down to normal by lysis.

Ammonium chloride gr. II q.i.d. given. Urine maintained a pH 5.5. Took food and fluid fairly well.

12-16-35 - Temperature normal. Urine negative. Weight 5830 grams. Gained 520 grams.

Discharged in good condition.

IV. CASE REPORT

CHRONIC RECURRENT PYURIA

, white female, aged 8 years.

Pyuria

1- -33 - Measles followed by fever and chills. Pus found in urine. Physician made diagnosis of pyuria. Repeated remissions and exacerbations since onset. Pain in left lumbar region, frequency, polyuria and some dysuria.

Cystoscopic

Spring '34 - Cystoscoped. Some edema of left ureter but not determined whether due to long standing infection or congenital anomaly. Has taken urotropin gr. III to V. Tried ketogenic diet without improvement.

Past History

Full term baby, low forceps delivery. Birth weight 8 lbs. 5 oz. Left otitis media since one month of age with intermittent discharge to date. Had measles, chickenpox and mumps. Tonsillectomy 1932.

Admitted

12-28-34 - Physical examination: essentially negative except for left ear, posterior 1/3 red and marginal perforations in anterior inferior quadrant of drumhead.

Laboratory:

Urine - acid reaction, heavy cloud of albumin, numerous white blood cells; culture - E. coli. Blood - hemoglobin 73%, white blood cells 7,100, polymorphonuclears 75%, lymphocytes 25%. Wassermann - negative. Mantoux - negative. X-rays: Kidney, ureters and bladder (12-31-34) - negative; Intravenous pyelography (1-3-35) - slight right hydroureter.

Course

Ketogenic diet: 1150 calories. (Present weight 25.5 kilograms, ideal weight 21.) 55 calories per kilogram. Carbohydrate 50, protein 30 and fat 80 grams.

1-9-35 - Cystoscopy: conclusions - subsiding pyelonephritis with secondary ureterectasis on right. Procedure: to continue ketogenic diet and recheck in 6 weeks.

Improved

During following weeks, urine continued to show a diminution of white blood cells. 1-26-35 - only 2 white blood cells reported per high power field.

1-22-35 - Temperature 103°. Reddened throat followed by drainage from right ear. Temperature continued around 102 for one week. White blood cells - 17,000.

2-9-35 - No discharge from ear. Urine culture sterile. Following organisms reported at various times - streptococcus, micrococcus, pseudomonas, pyocyaneus and E. Coli.

2-13-35 - Ammonium chloride gr. XX t.i.d. and urotropin gr. X q.i.d. started.

Diet Changed

Diet changed on 1-4-35 to $3\frac{1}{2}$: 1 ratio. Carbohydrate 12, protein 30 and fat 160 grams.

1-22-35 - Diet changed to carbohydrate 9, protein 25 and fat 100 grams.

2-21-35 - General diet.

Final Examination

3-1-35 - Cystoscoped. Urethra, bladder and ureteral orifices normal. Diagnosis - apparent recovery from acute pyelonephritis. Retrograde pyelogram also negative. Urine cultures from ureters = negative.

3-4-35 - Discharged.

Readmitted

10-25-35 - Admitted because of recurrence of symptoms. Was on 3 : 1 ketogenic diet with fluid restriction. Had been febrile for 2 weeks before admission.

Temperature up 102 daily.

Laboratory

Urine - strongly acid reaction pH 5.4, specific gravity high during entire hospitalization, occasional cloud of albumin, no sugar, white blood cells few to many, no red blood cells. Blood - hemoglobin 101%, white blood cells 10,900, neutrophils 81%, lymphocytes 17%, mononuclears 2%. Coagulation time - 6 min. 15 sec.; bleeding time - 2 minutes.

Course

Temperature 101 to 102 on day of admission. Was normal in 3 days. Slight nasal discharge.

11-4-35 - Tonsillar tags removed.

11-6-35 - Discharged. Ketogenic diet - carbohydrate 19, protein 30 and fat 175 grams. Urine - 8 to 10 white blood cells per high power field.

Followed in O.P.D.

12-13-35 - X-ray - left exudative mastoiditis.

12-16-35 - X-ray - bilateral maxillary sinusitis.

Readmitted

12-19-35 - Admitted because of frequency, dysuria and cloudy urine for 2 weeks and maxillary sinusitis (bilateral antra windows made on 12-20-35, no pus found in antra.) Urine - pH 5.4, many white blood cells. Postoperative course uneventful.

12-21-35 - Discharged.

Followed in Out-Patient Department.

1-17-36 - Recovering from slight upper respiratory infection. No complaints. Temperature 97.8. Urine - specific gravity 1.014, alkaline reaction, no albumin, 1 to 2 white blood cells.

V. LAST WEEK

Date: February 6, 1936.

Place: Nurses' Hall, Recreation Room.

Time: 12:15 to 1:23 P.M.

Program: Movie: Animal Intelligence. Hyperparathyroidism.

Present: 121

Discussion: Frank Howard Lahey.

Gertrude Gunn, Record Librarian.

VI. MOVIE

Title: Plant Growth

Owned by: Department of Visual Education

Released by: University of Chicago

VII. OUT-PATIENT DEPARTMENT REPORT

Comparative Report Six Months Period
July 1 - Dec. 30 1934-35 1935-36

	1934-35			1935-36		
	New Patients	Revisits	Total	New Patients	Revisits	Total
1. Admissions	2698		2698	2483		2483
2. Medicine						
General	257	8350	8607	268	9433	9701
Cardiac	252	718	970	224	753	977
Chest	111	1366	1477	103	1661	1764
Gastro-intestinal	336	6	342	433	3	436
Metabolism	47	355	402	62	314	376
Neurology	344	578	922	431	735	1166
Skin						
"L" clinic	68	3298	3366	61	3202	3263
Dermatology	395	1343	1738	419	1766	2185
3. Surgery						
General	928	3858	4786	1055	3903	4958
Genito Urinary	184	940	1124	210	1095	1305
Goitre	90	302	392	89	317	406
Reconstructive	32	95	127	39	171	210
Tumor	250	1337	1587	264	1399	1663
Gynecological Tumor	16	379	395	36	337	373
Orthopedic	310	568	878	296	809	1105
Urology - Female	175	522	697	128	471	599
4. Ear	267	798	1065	279	1032	1311
5. Eye						
General	882	882	1764	770	1186	1956
Refraction	361	65	426	588	34	622
6. Nose and Throat	646	1119	1765	616	1273	1889
7. Obstetrics	172	999	1171	190	912	1102
8. Gynecology	535	2194	2729	615	2163	2778
9. Pediatrics	595	1993	2588	598	2243	2841
10. Nutrition	71	214	285	67	210	277
11. Dental	31	38	69	48	107	155
Totals:	10053	32317	42370	10372	35529	45901

VIII. GOSSIP

After our Surgery for Hypertension meeting, an editorial appeared in the Journal of the American Association with a discussion of "Adrenal Surgery." After last week's meeting, there was a fine article on "Hyperparathyroidism" and an editorial on "The Relationship between Bone Disorders and Renal Calculi"..... .. Dr. Owen H. Wangensteen is away on a speaking tour which will take him through the pacific northwest and the southwest before his return early in March. This is certainly an ideal time to receive such an invitation.....The Sigma Xi lecture series will be concluded with Dr. McQuarrie's address on Friday evening of this week. The attendance throughout the entire series has been a remarkable tribute to our men and an example of the interest laymen have in medical subjects. .....We may complain about the New Deal but it has some very good things to its credit. Notable among these, has been the stimulation in interest and support of the campaign to bring to light syphilis in pregnant women. It has been found that a positive Wassermann reaction is a serious menace to the unborn child and antisyphylitic treatment should be started at once. Remarkable results are being obtained in this way.....Intern George W. Reeves is a graduate of the George Washington University Medical School. We are sorry but his second name is not "Washington".....In what part of today's abstract is the canary bird robbed of his feeding glass to be used for another purpose?.....Dr. Lahey made a very good impression last week with his easy, informal way of entering into our discussions and talking to the medical students. Following his address to them, he made a radio talk and then went to the Surgical Society dinner where he shifted to a technical surgical subject. He was apparently equally at home in the more fundamental principles underlying disease processes and in talking to the public, where he also displayed a rare sense of discretion and ease of manner. He told them among other things of his colostomy squad of volunteers who came to talk to prospective colostomy patients to not only assure tham that it was a wise thing to do but also to give them a demonstration of how their own colostomies worked. It is good to know men of his type and we are very grateful to the Minneapolis Surgical Society for sharing his visit with us.....Former Clayton Beecham, now doing graduate work in obstetrics and gynecology in Philadelphia, sends greetings to his friends, and also a little ditty on the young lady in San Francisco who is airing her troubles in court.....Everyone was stunned to hear of the death of Dr. Frederick W. Van Valkenburg of Long Prairie in an automobile accident last week during the blinding snow storm at Anoka. He was a very good friend of ours and we will miss him. The famous father and son combination in Long Prairie of Van Valkenburg & Van Valkenburg, and Christie & Christie was a friendly rivalry of a combination of the old and the new school. All four are splendid gentlemen and good physicians. Right on the heels of this report, we were shocked to hear of the death of Dr. Clifford Alexander of Duluth, who was killed in a fall. "Cliff" was also a good friend of ours and he, too, will be missed.....We have a letter from a woman who insists that she and her husband were poisoned by using aluminumware for cooking purposes. Following the gradual substitution of graniteware all their symptoms are supposed to have disappeared. Anyone who cares to answer can find the copy on my desk.....A Christmas card arrived last week from Dr. Harold J. "Speedy" Dvorak who is still in Prague. He expects to start for home soon and reports a very splendid experience,..... ...Dr. Ralph Rossen left on Saturday to assume his new position as Assistant Superintendent of the State Institution for the Insane at St. Peter, Minnesota. He will return each week for a day so we will still have an opportunity to see him. His friends wish him well in his new place.....John Hynes, Jr. is back from Florida with a coat of tan and a flock of stories. He succeeded in making most of his friends feel sorry for themselves up here.....The report of the Out-Patient Department is furnished by Director Ray Amberg. It is interesting to note how some departments change.....

Adios.