SPECIAL ARTICLE

MEDICAL RECORDS THAT GUIDE AND TEACH

LAWRENCE L. WEED, M.D.

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THE beginning clinical clerk, the house officer and the practicing physician are all confronted with conditions that are frustrating in every phase of medical action. The purpose of this article is to identify and discuss these conditions and point out solutions. To deal effectively with these frustrations it will be necessary to develop a more organized approach to the medical record, a more rational acceptance and use of paramedical personnel and a more positive attitude about the computer in medicine. Eventually, for every physician all three areas will be an obligatory part of his professional environment if he is to play a significant part in the total health-care job that will have to be done. The organization of the medical record should be a matter of immediate concern to practicing physicians and students; the degree of involvement of any individual practicioner with paramedical personnel and the computer will vary with the particular environment and facilities. Developments in all these

9/10

Pt. received 40 units of regular insulin yest. because of B & 4+ urine sugars. Got 2000 cc Amigen yest. & 500 cc D_5W. Was febrile all night up to 40 at 8 PM this gradually came down to 39. 8 PM yest. suctioned & coughed up c̄ return of ½ cup of thick white sputum – cultured also blood cultures. Was in must. tent c̄ mucomist overnight. At 4 PM yest had B-R base. Sputum smear unremarkable – WBC's but no bacteria.

9/10-12:30

10 o'clock urine 2-3+/0. Given 10 U. reg. ins. at 12:30 PM. Temp. down to 38? Suctioned N.T. ō little return. However during suctioning pt. vomited 100-150 cc green fluid. Proximal jejunostomy tube draining well now.

9/11-9 AM

Urine 3+ given 10 U reg. insulin. Pt. was hiccuping all night & this AM. Levine tube passed c̄ 900-1000 cc bileous fluid removed. Jejunostomy tubes have been draining minimally. Will have Levine tube down.

(THREE PAGES OF SIMILAR NOTES FOLLOW UNTIL **9/26/67**)

9/26

Last night 10PM had seizure like behavior and acting strange. Apparently hallucinating. Blood sugar didn't register on destrostix. Had been given 10 units reg. insulin at 8 PM after IV glucose returned to nl. This AM vomited up brown black fluid 300 cc + for occult blood. NG tube had been out since 5 PM yest. NG tube replaced & some material small amt. withdrawn. Pt. now NPO ō NG. tube to Gomco.

9/27

Still febrile – Ampicillin 1 g qid – continued; Blood cult. drawn to check if septicemia still present. Chest x-ray today shows infiltrate in (R) lower lobe. No effusion. Sputum grew out pseudomonas but Dr. _____ elected not to treat this.

ON SERVICE NOTE (please read revised problem list and please use #'s shown)

10/2-6 PM

#1 Chronic Relapsing Panc.:

b. *Diabetes:* will continue moment-to-moment Rx of spot urines for now. Today c̄ only 10 U regular insulin pt. spilling mainly 2-3+.
Plan: BLD sugar tomorrow

c. *Panc. insuff.:* will begin Cotazyn-B

#2 Complications Following Laparotomy:

c. *Post op ileus:* KUB tomorrow. Pt. now tolerating ice cream and occ. candy. bs. poor; s gross distention; stool passes regularly ⟶ fistula
Imp: prob. resolving now
Plan: KUB and continue small feedings

d. *Sepsis:* afebrile now on Ampicillin. see flow sheet. Reculture tomorrow.

b. *RLL Pneumonia:* Film of 9/28 shows some ↑ in this process. Will repeat P.A. chest tomorrow & cultures.

e. *Colonic-Cutaneous Fistula:* Continues to drain semi-formed stool several times per day; the problem is that stool drains onto granulating abd. wound.
Plan: culture stool; Remove some non-func stay sutures; Freq dressings & consider colostomy bag for fistula

10/3

#1 Chronic Relapsing Panc.:

c. *Panc. insufficiency:* Cotazyn-B will be begun (special purchase) and will evaluate effect on absorption and/or stool content by measuring amt of fat

f. *Pain:* pt. still requires freq narcotics. Neurosurg will evantually perform epidural block and depending upon results will consider cordotomy

#2 Complications Following Laparotomy:

b. *RLL Pneumonia:* Chest x-ray today shows marked resolution of previously described infiltrates; pt. has been afebrile – sputum recultured (see #2d).

c. *Post op ileus:* KUB today shows little improvement from film of 9/29. Ba in same position in colon which is distal to fistula. Despite this x-ray findings will continue to feed (see #2f). Bowel sounds poor and abd. seems slightly more distended. Will give oil retention enema to try to clear distal colon.

d. *Sepsis:* Pt. has been afebrile, cultures repeated today; ō (M) heard today; has been on Ampicillin x 9 days. Although potential still present this problem is under relatively good control.

e. *Colonic-Cutaneous Fistula:* all stay sutures removed today and wound is well granulated but constantly bathed c̄ stool. Colostomy bag applied to try to control this drainage. Etiology of fistula? but may be serving decompressive function.

f. *Malnutrition:* Total protein = 6.1 c 2.1/4.0 = A/G in 1965. Wt. has ↓ from 141# ⟶ 113# since adm.
Imp: little resolution of ileus, in fact, most of food stays in stomach probably; this remains the main problem; other as above fairly well controlled except malnutrition.
Plan: as above plus give gastro-graffin per NG tube and watch progress; *avoid surgery.*

FIGURE 1. *Sequence of Notes Extracted from a Complicated Record.*

In the first, unstructured portion, facts and phrases are presented that suggest difficulties in many systems, but the confusion in such a tangle of illogically grouped bits of information is such that one can not reliably discern how (or if) the physician defined and logically pursued each problem.

On 10/2 a new physician took over, and the improvement is apparent. By reading the titles alone of each of the progress notes one begins immediately to grasp the nature of the case. In this and in all other figures, the record is reproduced as originally phrased, without editing.

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PROBLEMS

#1. Rheumatoid Arthritis
#2. Anemia
#3. Neuritis
#4. Edema
#5. Depression
#6. F. U. O. (see note 5/11)
#7. Vomiting
#8. Hiatus Hernia
#9. Diverticulosis
#10. Pneumonia
#11. Gall bladder disease

#1 Rheumatoid Arthritis –
Beginning about 1963 the patient began having multiple joint symptoms characterized by pain and some limitation of motion. She has been followed by Dr. _____ for this since that time. She had a positive latex fixation test at that time, a uric acid of 2.0. In 1966 the knees were injected with Aristocort with symptomatic relief. She has continued to have a moderate amount of joint symptoms although no severe deformity of any joint.

Therapy has consisted of salicylates which she continues to take. 15 grains, every four hours, Prednisone being started in September, 1966 with dramatic improvement for about a month, but persistent symptoms since that brief improvement, her regular daily dose being 5 milligrams twice a day although at times at home she has taken 20 to 25 milligrams per day. Additionally she took Aralen temporarily without significant improvement.

#2 Anemia –
In February 1966 the patient was found to have a hematocrit of 29 to 31% marked-hypochromia, multiple stools positive for occult blood, hiatus hernia demonstrated by x-ray, diverticulosis of the colon and negative sigmoidoscopy. A folic acid was 2 picrograms percent (normal is 5 to 6). Serum albumin 3-0, globulin 3.0. No PBI, serum iron or reticulocyte count or bone marrow were done. A serum B-12 level was normal. In December, 1966 hematocrit was 26%, bilirubin less than 1, and in March 1967 hematocrit was 39%. Treatment has consisted of multiple vitamins, temporarily on En-Cebrin F but currently on a simple multiple vitamin and Thiamin intramuscularly daily. No folic acid. Additionally she has had several blood transfusions and had received iron in the past although is not on iron. The hematocrit today is reported at 27 28% with a normal white count and differential.

#3 Neuritis –
For approximately two months the patient has had considerable paresthesias particularly in her feet, described as painful sensations with numbness even at rest. Dr. _____ found absent reflexes in the lower extremities and absent vibratory sense. Pain was intact. Peripheral pulses were normal. She has had marked peripheral edema the past two or three months. The cause of this neuritis has remained obscure.

#4 Edema –
Marked peripheral edema and facial edema has been noted for several months. The last serum albumin reported was in February 1966 – 3.0. A 2 hour PC blood sugar was 150 milligrams percent in December 1966 and Potassium of 5.3. BUN 20 milligrams percent and negative urinalysis on 3/67. Chest x-ray at that time revealed slight cardiac enlargement. This was a portable film, but was not particularly suggestive of congestive failure. Blood pressures have been in the normal range of 150/80, a grade II murmur has been present. She has not been digitalized. She has been on salt restriction because of her steroids and has received Diuril in the past without significant effect on the edema.

#5 Depression – personality change –
The patient relates that she has not felt well for a number of years, seeming to date this most closely to the death of Mrs. _____, the lady for whom she worked some eight or ten years following her husband's death. She had a very close relationship with this lady, was very fond of her and often thinks of her now. She feels she began having her joint pains at about the time of her death and has never worked since that time. She does not believe there has been any impairment in her thinking or memory. She does believe there has been some voice change in the form of hoarsness or lowering and slight temperature intolerance to cold. She finds herself crying a lot. Recently in the home the nurses have noted that she is temporarily disoriented and hallucinating images such as animal. At times she is not very communicative, at other times seems somewhat hostile, fearful that anyone will touch her and this will be painful. A recent trial on Elavil was without any apparent benefit. She is currently on Thorazine 25 milligrams every four hours with little objective or symptomatic improvement and she is complaining of a dry, sore tongue, possibly related to this.

REVIEW OF SYSTEMS:
Central Nervous System: denies headaches or dizziness
Special Senses: vision seems fair although seems to fluctuate. is able to read the paper and hears fairly well.
Respiratory: infrequent colds. Denies pneumonia or chronic cough. sleeps on one pillow.
Cardiovascular: no known heart trouble other than slight cardiac enlargement by x-ray. Grade II systolic murmur noted in the past. Blood pressures have been 150/80. Peripheral pulses have been intact in spite of the marked peripheral edema and facial edema.
Gastro-intestinal: Hiatus hernia by x-ray in 1966. Denies indigestion however. Also diverticulosis by x-ray. The patient has not been on any ulcer prophylactic regime. Occult blood in stool has been noted on at least two admissions.
Genito-urinary: no known kidney trouble. About 1 X nocturia. BUN's of 18 and 20 milligrams percent on previous admissions with negative urinalysis. This also repeated today.
Muscular Skeletal: see HPI No. 1
Hematologic: see HPI No. 2
Metabolic: Potassium of 3.8 in December 1966. Weight is said to be fairly stable at about 145 to 155.

PHYSICAL EXAMINATION:
P/P 150/80 I.A Pulse 96 and regular T – 100 Weight
This is an elderly lady who has a low pitched froggy type voice, however the Thorazine may very well be contributing significantly to this. There is rather marked puffiness of her face, eyelids. Her affect is rather flat, yet her memory seems good although her recall seems slow. (Physical examination completed in usual manner.)
#1 Rheumatoid Arthritis – maintained on Aspirin gram 15 q.4.h. and Prednisone 5 milligrams twice a day.
#2 Anemia – probably related to blood loss by G.I. tract but also rule out persistent folic acid deficiency and hypothyroidism. R/O myxedema & folic acid def.
#3 Peripheral neuritis – uncertain etiology
#4 Peripheral edema – uncertain etiology – malnutrition
#5 Depression and memory impairment or slowing up of thought processes – uncertain etiology – myxedema.

PLANS:
#1 Continue same regime although would suggest elevating head of bed. addition of Belladonna and Maalox PC and HS.
#2* Serum Iron. folic acid, total protein AG ratio. PBI.
#3 Continue multiple vitamin possibly should add folic acid. Folic acid level to be checked.
#4 Evaluate serum protein level as well as PBI.
#5 Probably I am overly impressed by her skin texture suggesting myxedema and her voice changes which may be due to the Thorazine. If the PBI is normal, then perhaps a more vigorous or intensive trial on antidepressants, more rapidly acting such as Pertofrane or Aventyl should be given or possibly shock therapy employed.

5/11

#1 R.A. – no change – unable to take meds today.
#2 Anemia – Serum Fe 36 Folic acid NL Hgb. 8.5 gms. today.
#3 Neuritis – no change.
#4 Edema – no change clinically – PBI + Total I normal
(severe hypo-albuminemia)
Cal. count + 1 spec. prot. intake per day.

*Note how readily one detects the absence of stool guaiac tests in these initial plans for this particular problem. The physician did recognize this aspect, and in a later numbered and titled progress note three negative stools are discussed.

Plan was to pass N.G. tube if Dr. _____ (E.N.T.) found no lesion and he did not on exam today – force feed via tube for a few weeks.

#5 *Depression* – patient agitated during nite – lost weight – given Thorazine 25 mgm @ midnite (had 75 mgm Elavil yesterday) today semi-responsive unable to take orally and has *low grade fever.**

P.E.:

B.P. 140/70 P. 80 & reg. T. 101ᴿ R. 32/min.
Responds to voice occasionally – pain regularly – not intelligible speech.
EENT – nl. except dry mucous mem.
NECK – supple – carotids nl.
LUNGS – clear, aerate well.
HEART – NSR – Gr. II sys. Murmur – ō gallop, rub, etc.
ABD. – soft, obese – ? RLQ tenderness & ? RLQ mass.
P & R – deferred
NEURO – responds as noted – DTR's symmetrical, depressed ō pathologic reflexes.
SKIN – several ecchymotic areas & superficial abrasions marked generalized edema – waxy turgor to skin.
CHEST X-RAY – cardiomegaly

*See footnote for fever of unknown origin.

WBC – 10,000+
Urine – not obtained
Imp. Same Plus – #Fever unk. origin†
Plan – Adm. for observation

5/13

#2 *Anemia* – will recheck Hgb. Hct. today – to get IM Fe – 20 cc Imferon
#4 *Edema* – malnutrition – #16 plastic tube inserted yesterday.
#5 *Depression* – perhaps a little more responsive. Wants water P.O. – off psychotropic drugs.
#6 F.U.O. – will insert foley cath. to preserve skin; and evaluate U.T.I.; 540 cc; Mic – neg

5/15

#4 *Edema* – nutrition – tolerating NG feeding
750 cal. – 250 a q 3 – will increase to 350 a q 3 – 1,000 cal/24°

(This record continues on for the next six months, with gradual evolution of all the problems and remarkable resolution of some, such as the edema, the poor nutrition, and the psychiatric difficulties. Problem-oriented discharge summaries facilitate rapid assessment of cases such as this.)

†The pattern of the physician's thought is suggested as he discusses the semi-responsiveness under the Depression, momentarily couples the fever with both and then quickly decides to follow the fever as a separate problem under fever of undetermined origin after finding a supple neck and no localizing signs. Should he have done a lumbar puncture before he decided to leave the semiresponsiveness with the depression and drugs, but formulate the fever as a separate problem? A problem list and titled progress notes reveal the context in which thoughts occur and actions are taken. Knowledge of content without context can be useless or even misleading.

FIGURE 2. *Record, Randomly Taken from the Files of Two Physicians Currently Conducting a Busy General Practice in a Small Town in Maine, Showing the Approaches Advocated.*

The internship training of these doctors was based upon problem oriented patient records and care. One may not necessarily agree with the medical decisions, but the manner in which each problem is formulated, pursued and related to the other problems makes it possible for one to assess quality rapidly in terms of the physician's thoroughness and analytical capacity.

There have been minor, but useful, modifications in form since the time of the rotating internship of these particular practitioners nine years ago. In the initial plan, not only the number but the title of each problem is used, facilitating even more rapid audit of the physician's approach to a particular situation. It will also be noted that problems #8 – Hiatus Hernia – and #9 – Diverticulosis – were not listed at the time of admission even though they were known. All significant problems should be entered as soon as they are known, noting but not omitting those that are inactive or resolved. Also, progress notes should follow a form similar to that seen in Figures 3 and 4, in which the physician first discusses the problem from the patient's point of view (subjectively, Sx), then states all appropriate objective data (Obj.) pertinent to the patient's problem, states current treatment (Rx), gives any new interpretations (Int.) and, finally, discusses the plan for the next interval.

fields are far more advanced and immediately applicable than many realize, and concern with them is neither premature nor impractical.

NEW TECHNICS MUST BE ADOPTED

Among physicians there has been uncritical adherence to tradition in the first phase of medical action, which is the collection of data, upon which complete formulation and management of all the patient's problems depends.

Routine completeness is expected of physicians in the history and physical examination regardless of specific indications, whereas initial laboratory determinations are arbitrarily relegated to an "only-when-indicated" category. Subclinical disease may thereby be missed. Extravagance is then paradoxically demonstrated by the ordering of excessive and inappropriately selected follow-up laboratory and x-ray examinations for the problems clinically evident. Thoroughness and order in the whole process decrease drastically and indiscriminately as work pressures build up, so that finally among physicians there is a remarkable spectrum of behavior from the compulsively elaborate to the sketchy and haphazard. In the field of medicine it has never been clearly determined what the minimum, effective initial data base needs to be.

In the face of the confusion concerning the necessary quantity of data, the initial collection of data should be made as significant and complete as possible. The only limitations should be the discomfort, danger and expense to the patient. If useful historical data can be acquired and stored cheaply, completely and accurately by new computer and interviewing technics without the use of expensive physician time, they should be seriously considered. That this is already so is strongly suggested by the work of Slack,[1,2] and by results of present efforts in our clinic using trained interviewers and computerized approaches to the recording and printing of narrative, historical data. By such measures every patient can be guaranteed a minimal recorded data base of historical information routinely acquired by a trained interviewer or by direct patient interaction with an organized series of branching questions presented on a television screen terminal. The doctor will always be expected to read this information, enlarge upon it where indicated, and integrate it with that which he himself elicited. In this way the recorded historical data will not be based on a sin-

PROBLEM LIST

6/17 #1 Rheumatic Heart Disease
a. Mitral insufficiency
b. Atrial fibrillation
c. Compensated congestive failure TTB
d. Cardiac catheterization
e. Successful cardioversion
#2 Presumed SBE
#3 Mild Diabetes Mellitus – adult onset
#4 Repeated pulmonary embolism
#5 Post. Inferior Vena Cava Ligation
#6 Allergic dermatitis
7/3 #7 Arthralgia
9/8 #8 Family problems

8/5 – CARDIOLOGY
TEMP – 36.5 WEIGHT 73.6 kg

#1 RHD:
Sx – excellent exercise tolerance – does housework, taking walks, etc. no SOB
Obj – wt. ↑ again 4 lbs P 100 reg. c̄ rare P /C BP 150/90
chest – few rales @ (L) base that do not clear c̄ cough; cor. – unchanged
Rx – unchanged – see flow sheet
Plans – in view of excellent clinical response and exercise tolerance I am not concerned about rales but will continue to watch
a. Quinidine 0/200 q2h #300
continue other meds

#5 Post IVC Ligation:
Sx – ō
Obj – leg swelling continues to be a problem esp. during the hot weather
Rx – unchanged
Plan – 1. ↑ Naqua to 0/002 QD
2. Coumadin 0/005 QD
3. protime today
RTC 3 mos.

9/8
#1 Arthralgias – see EW note 9-3-66
Sx – continues @ about same intensity but more concentrated in (R) arm (cath. done in that arm).
Obj – ASO neg. RH factor – not significantly ↑. Repeat sed rate – films of shoulders, elbows, wrists
Rx – symptoms *exascerbated* by ASA – some relief by heat
Plan – a. uric acid, serum glob, LE prep
b. observe

#8 Family Problems:
pt. has been upset lately by husband's constant admonitions not to over-do herself and his general over protective attitude. Today was very upset, depressed and crying – it is now obvious that more fundamental conflicts exist in this marriage. Husband drinks, is jealous of attention she gives the children, etc.
Plan – have asked her to have husband call me and will get a greater feel for the situation starting with the part of the conflict revolving around her medical condition

9/23

Was pelvic (& pap) done during adm? if not, suggest having these done.

#1 RHD:
Sx – continued excellent exercise tolerance
Obj – wt ↑ 2 Kg B 160/70 P 100 reg: chest – clear; cor – as above
Rx – Digitalis 0/100 QD, Quinidine 0/200 qid

#5 Post IVC Ligation:
(R) leg now back to normal s̄ edema but (L) leg now swells even more and often does not go down @ night – becomes heavy and cumbersome
Rx – Naqua seems to help but not taking QD
Plan – a. Naqua QD
b. refer to peripheral vasc. clinic
c. D/C Coumadin

#7 Arthralgia:
Sx – comes and goes but essentially about the same overall. A.M. hand stiffness seems to be her biggest complaint.
Obj – joint films ⟶ osteoarthritis changes in elbows and hands
Rx – ō – heat, rest, ASA
Plan – continue above

#8 Family Problem:
marked improvement p̄ she mentioned to husband that I wanted to talk c̄ him. He has not called but has been much improved in his attitude toward her and the children.

FIGURE 3. *List of Problems and Associated Clinic Notes on a Patient Being Seen in a Busy Outpatient Department of a Large Urban Hospital.*

This list is a permanent part of the record, and new problems are added as they appear such as the arthralgia and family problems in this particular case. The latter is an example of a good physician who did not limit himself to the strictly medical or organic questions. (Note that all problems are not necessarily dealt with on each visit; the extent of the thought and care given to each situation is clearly defined).

gle encounter with anyone, and busy physicians, who represent a wide spectrum of abilities, habits of thoroughness, attitudes and levels of efficiency, will not risk important omissions.

Paramedical personnel, armed with questions and interviewing technics, and with multichannel analyzers, pulmonary-function tests, electronic instruments for studying all systems (particularly the cardiovascular system) and simple routines to assess the musculoskeletal system can create a sound data base rapidly and accurately. At this institution* there has been developed a computerized physical examination whose performance requires a high level of thoroughness and precision, but a significant part of it can be performed by paramedical personnel. The "print-outs" from the computer of both the interview and the physicial examination are in readable narrative form with only the positive findings printed out under the appropriate system heading. Nurses properly trained could guarantee a certain high level of excellence in breast, abdominal and pelvic examinations. They already do Papanicolaou smears and have nonmedical cytologists interpret them. Having established a large data base in the computer for a large number of patients over a long period of time, we should study it, restructure it and eliminate that which is nonproductive.

Properly trained paramedical personnel can both contribute greatly to the data-collection phase and help teach it. The medical faculty must become far more interested and expert in teaching the analysis of medical data, the complete formulation of the problems, and the disciplined following of each. When these things are done in a complete and rigorous fashion, many problems emerge in a single patient.

*This work has been under the direction of Dr. Charles Burger and Mr. Eugene Lovasy.

ORGANIZATION OF THE PATIENT'S MULTIPLE PROBLEMS

Whereas a good scientist focuses on a single or

Intern's Admission Note:

67 yr. old white male admitted from OPC for elective T.E.A. of (R) superf. femoral artery

#2 Generalized arteriosclerosis c localized block at superf. femoral on (R):

Subj – about 5 yrs. ago had episode of gangrene (R) 5th toe and was admitted to ____ where p conservative Rx apparently failed and Dr. ____ performed (R) lumbar sympathectomy which also failed to heal toe. Subsequently lost (R) 5th toe surgically but still didn't heal well and was admitted to ____ under Dr. ____'s care where ulcer healed c conservative Rx. Since then has noted slow healing on feet; had (R) common fem. arteriogram 5 yrs. ago under Dr. ____'s direction p translumbar arteriogram failed (these records of five years ago are lost currently and pt. gives this info.).
About one year ago noted onset of severe claudication (R) leg p ½ block and a little later "burning pain" on sole of foot. To the present this has worsened slightly. Since that time followed conservatively in OPC. Smokes 1-2 packs/day; denies ETOH'ism.

Obj – 11/28/66 had (R) common fem. arteriogram showing local block between middle and distal 1/3 of superf. femoral

Pulses in OPC –		F	P	DP	PT
11/8/67	(R)	2+	–	–	–
	(L)	1+	–	–	–
10/26/66	(R)	2+	–	?+	?+
	(L)	2+	–	?+	?+

Never any ulcers noted on feet in last 1 yr. of OPC visits

Rx – pain meds, foot hygiene
Negs – neg Kline test (1966); o h/o diabetes
FBS = 98 in 1966; o pain c elevation
denies trauma

#1 S/P CVA 17 yrs ago:
Residual (L) hemiparesis and tremor (L) leg – takes Dilantin for this. o double vision, headaches, or dizziness. o loss of consciousness.

#3 Labile hypertension:
Subj – none
Obj – o cardiomegaly 1 yr. ago by x-ray
EKG – sinus tachycardia early 1966
– WNL late 1966
BUN = 15 in 1966; Cr = 1.0. 1966
U/A in 1966 = WNL
BP last admission ranged = 190-140/70-110
Last BP recorded 10/66 = 140/80
Rx – none

#4 Benign Prostatic Hypertrophy:
Subj – frequency, urgency, and ↓ stream x 1-2 years. nocturia x 3; o dysuria
Obj – residual in 1966 = 120 cc, IVP 1966 = WNL., cystoscopy in 1966 = median lobe impingement on urethra.
S/P open biopsy in 1966 because of nodule (L) felt by rectal – benign prost. hypertrophy, acid phosphotase = WNL x 2; bone series – negative
Rx – none right now
Negs – o h/o UTI's in recent or remote past

11/12
9 PM

#5 (L) inguinal hernia – reducible:
Subj – o
Obj – noted on P.E. in 1966
Rx – none
Negs – o vomiting, pain, or trouble c BM's

#6 H/O peptic ulcer disease:
Subj – has had pain in past in epigastrium and in p 1 month it has been worse; burning awakens him at night, relieved in AM by food; coffee and cigarettes make o difference. position makes o difference; says he's had dark black-brown stool x 1 month.
Says he had UGI 5 years ago which showed "very small" ulcer "which Dr. ____ said not to worry about."
Obj – Hct 1966 early = 46-36%
Hct 1966 late = 45%
o guaiacs available: LFT's 1966 = WNL
Rx – Maalox ⟶ relief
Negs – o food intolerance, vomiting, diarrhea, jaundice, chills or fever

Patient Profile:
lives on pension at home c wife and son; the latter works qd; he walks in neighborhood but not far

FIGURE 4. *Statement of the Present Illness of a Patient Being Seen by a Busy Intern on the Surgical Service of a Large Urban Hospital. It can be seen that this intern writes the present illness in terms of specific problems, discussing the major problem for this particular admission first, even though it is the second one on the original problem list. The patient profile is the portion of the record in which we define how the patient spends his average day at home so that long-term management of his problems will be appropriate to his way of life. The profile presented here should be more detailed so that one might have a more complete picture of exactly how he lives. It is usually the first portion of the record after the chief complaint.*

very limited number of problems, pursuing each until he finds a solution, the physician is asked to accept the obligation of multiple problems in a given clinical situation and yet to give each the single-minded attention that is fundamental to developing and mobilizing his enthusiasm and skill. The university education a physician receives suggests that his attitude should be scientific in focus, but the multiplicity of tasks that confront him during his clinical training often defeats this goal. He can act as a scientist, however, if he is able to organize the problems of each patient in a way that enables him to deal with them systematically.

It is here that an organized approach to the medical record can help. At present the physician has to read the entire record (often illegible and handwritten) and then sort the data in his mind if he is to know all the patient's difficulties and the extent to which each has been analyzed. There is no evidence that he does this reliably and consistently; he and others using the record lose their way, and problems get neglected, missed entirely or treated out of context (Fig. 1). One solution is to orient data around each problem. Each medical record should have a complete list of all the patient's problems, including both clearly established diagnoses and all other unexplained findings that are not yet clear manifestations of a specific diagnosis, such as abnormal physical findings or symptoms.[3-5] When the data warrant, these findings can be crystallized into a specific diagnosis. The "problems list" then is not static in its composition, but is a dynamic "table of contents" of the patient's chart, which can be updated at any time. Separate problems all found

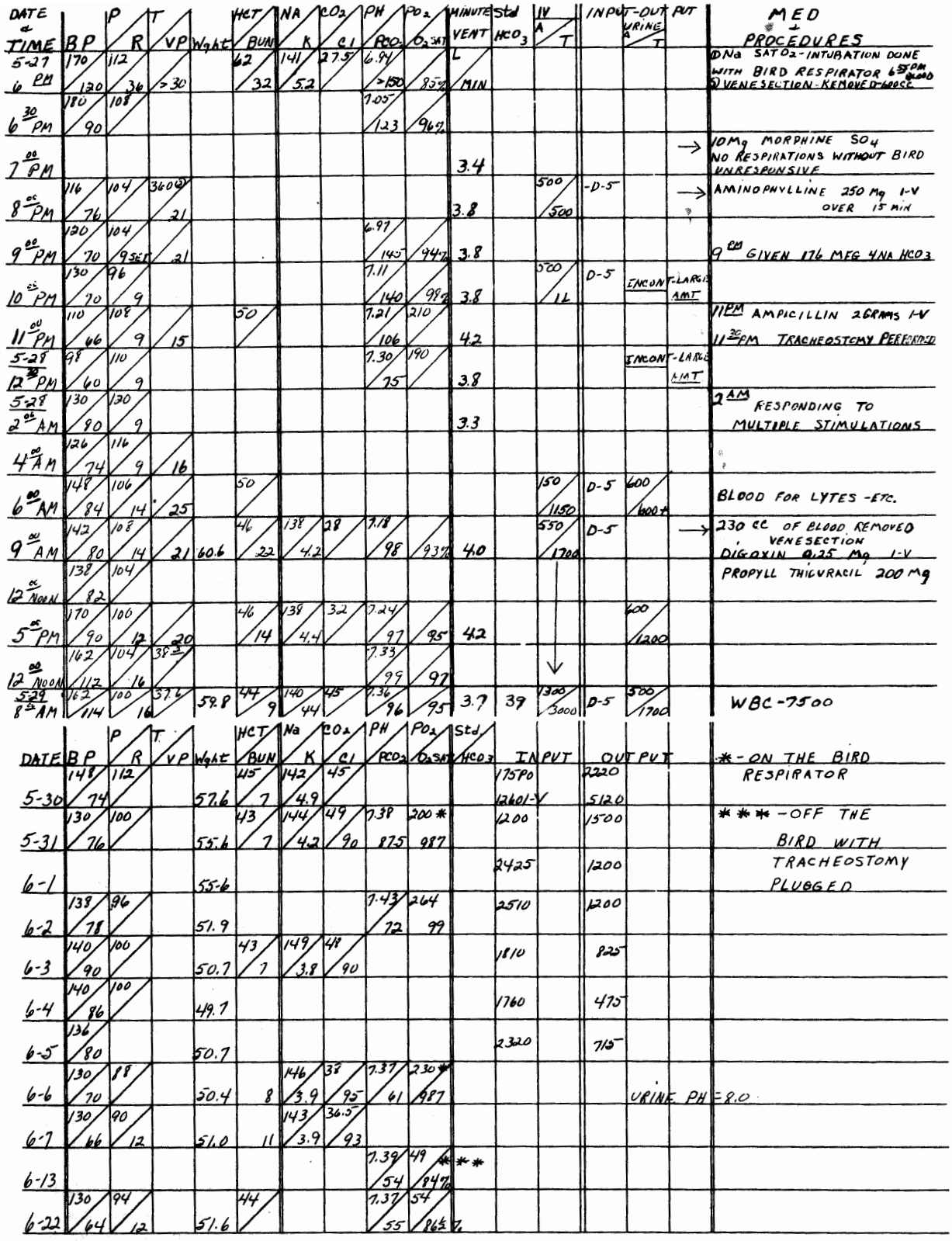

FIGURE 5. *"Flow Sheet" Written by a Physician on a General-Medicine Ward at the Time the Data Were Acquired, Not in Retrospect. This represents the course of a patient with a history of tuberculosis and a pneumonectomy who appeared with acute respiratory failure, cardiac failure, trilobar pneumonia and unexplained thyromegaly. One may question some of the data and decisions, but one has no difficulty in rapidly assimilating the course of this complicated cardiorespiratory situation, as seen through the eyes of this physician.*

Flow sheets should not be limited to patients with acute problems. Many chronic difficulties are best understood and managed by relation of multiple variables over time — daily, weekly or monthly. Patients with hypertension, diabetes and renal and liver disease are among the many who require well structured and up-to-date flow sheets.

to be part of the same entity or diagnosis may be combined. The list is separated into active and inactive problems, and in this way, those of immediate importance are easily discernible, and a compact history of the patient is embodied in the complete list. Once such a list has been established all subsequent orders, plans, progress notes and numerical data can be recorded under the numbered and titled problem to which they are specifically related (Fig. 2-4). For example, if we know that the patient has a perforated ulcer, it is so stated; if we are not sure, we honestly state the problem as "abdominal pain" and immediately update it on the original list to perforated ulcer only when the evidence allows. Lists of "impressions" and guesses fail to convey the exact level of resolution of a problem and may result in premature interruption of diagnostic action. Students must be taught to acquire a capacity for the "sustained muddleheadedness" and the tolerance for ambiguity that Whitehead considered so essential when difficult unexplained findings are dealt with. A diagnosis is a step forward only when it can be sustained by the evidence at hand.

Inherent in the problem-oriented approach to data organization in the medical record is the necessity for completeness in the formulation of the problem list and careful analysis and follow-through on each problem as revealed in the titled progress notes, requiring that the proper data be collected and that the conclusions drawn from this data are logical and relevant. The precision of titled, problem-oriented progress notes and conclusions is directly related to the precision and integrity with which the problems are initially defined. The uncertainties inherent in complex biologic systems make titled progress notes the most crucial part of the medical record. There are never right or wrong single decisions in difficult cases, there are only intelligent and logical or unintelligent or illogical series of decisions carefully or carelessly followed.

For certain problems a narrative progress note is not adequate for relating multiple variables.

Data involving physical findings, vital signs, laboratory values, medications, intakes and outputs can lead to sound interpretations and decisions only if they are organized (by means of a "flow sheet") to reveal clearly temporal relations (Fig. 5). How often do younger physicians see older ones flip through a record, expound on a single laboratory value, call at random for others in a "stream-of-consciousness" way and give an essay beginning with "in my experience"? Time relations are ignored, crucial data are never brought to light, and wrong decisions forever go unrecognized, because no tracks or logic pathways are discernible in the randomly recorded data.

Flow sheets can be used to facilitate the comprehension and interpretation of multiple interrelated and changing variables. On certain fast moving problems the flow sheet may be the only progress note. The time required initially in setting up a proper flow sheet is small compared to that wasted unraveling and reassembling disorganized and misplaced data. One major goal of clinical teaching should be to designate the problems that should have a flow sheet, the variables that should be included and the frequency with which they should be followed.

When the procedure outlined above has been done manually, a basis for computerization will have been provided, and when it is implemented, all data on a given problem will be instantaneously retrievable in sequence and a physician will be able to focus on one problem at a time, seeing the flow of data over extended periods. He will then be prepared to relate that fully digested problem to the other problems by returning to his up-to-date problem list.

Since a complete and accurate list of problems should play a central part in the understanding and management of individual patients and groups of patients, storage of this portion of the medical record in the computer should receive high priority to give immediate access to the list of problems for care of the individual patient and for statistical study on groups of patients.

It would seem most logical to have the physician enter the problem statements directly into the computer. Work at this institution,[6] after analysis of large numbers of manually recorded problems, has demonstrated the feasibility of using logically grouped displays of such problems on a television screen terminal. The physician makes a choice and, in some situations, will be led through further displays requiring more careful delineation of the problem. For example, he will first be required to state whether the problem in a given organ system is an etiologic diagnosis, a physiologic finding (such as heart failure), a symptom or a laboratory finding (such as an abnormal electrocardiogram). If he chooses heart failure he will be required in the next display, which appears automatically, to say whether compensated or decompensated, biventricular, right or left side. These previously prepared displays enable easy coding and yet give freedom of expression to the physician. This method is a tacit teacher because it requires the physician to formulate his problems consistently, completely and accurately. A large number of such precisely defined problems will provide the necessary data base to allow reliable work by statisticians to be undertaken.

It can readily be seen that all narrative data presently in the medical record can be structured, and in the future all narrative data may be entered through series of displays, guaranteeing a thoroughness, retrievability, efficiency and economy important to the scientific analysis of a type of datum that has hitherto been handled in a very unrigorous manner.

Implementation of More Comprehensive Care through the Medical Record and the Computer

The organization of the record described above forms a framework that easily accommodates psychiatric, social and demographic problems. Usually these are not documented and followed in an organized manner.

Psychiatric Problems

In the practice of medicine for many physicians, nonorganic problems have been neither challenging nor interesting. Because of this they have never been listed – even though they easily could have been – with the physician using clear descriptive formulations such as "cries easily" or "family difficulties" if he could not use sophisticated psychiatric jargon. Until all psychiatric problems are consistent objects of the physician's attention and are numbered and titled as such, it will not be possible for him to watch them evolve and thereby learn systematically from his own experience. Furthermore, by ignoring them he has never developed an appreciation for patterns of emotional disturbances, his attitude toward modern technics of analysis becoming at best one of anxiety and perplexity and at worst one of disinterest, ignorance and uninformed rejection.

The computer is making a major contribution in this area. The vast amount of research on the Minnesota Multiphasic Personality Inventory (MMPI) and the computerization of the analyses of the MMPI have made it much more likely, where it is employed, that the patient will gain from his physician an immediate sympathetic understanding of the forces with which he or she is struggling, and much inadvertent neglect and inadequate analyses by the medical profession can be avoided. There are many physicians who reject the help of modern technics on the basis that Osler for three hours followed by Freud for three hours could have done better. Even if this were true, modern technics are not competing in that league, but rather they are competing with hasty "off-the-cuff" five-minute analyses by untrained, impatient physicians who live from case to case and who have no systematic means of learning and improving from a highly organized and recorded data base which is kept up to date.

Demographic Problems

Physicians have for years been preoccupied with episodic illness, with problems only when they erupt into symptoms and only with patients who can get themselves to the doctor. At present it is almost impossible to obtain the history of illness from its earliest stages on a sample of the population, or even on an individual. And except for a few pioneers such as Robbins and Hall,[7] most of us do not even think of demographic problems, let alone record, understand and deal with them. As they point out, for a 40-year-old woman whose problem list contains only a fractured arm, we have completely neglected the fact that it may be of major medical significance to her that she is 40 and female and over the next ten years her greatest medical risk is cancer of the breast, and for her a yearly breast examination is the most important part of her care. We are so accustomed to dealing with disease only in the individual and only after it becomes explicit, symptomatic or terminal, that we think people are talking about another field when they discuss health hazards from automobiles, smoking, alcohol, diets, smog, family problems, hereditary factors or mental stress – or just being fat or 40 – male or female.

The problem list of the medical record should include demographic problems as well as all others. This will lead to very specific action appropriately timed for preventive procedures and will continually remind us of exactly where in health care our total obligations lie.

Paramedical personnel, such as public-health workers, social workers, psychologists and chemists, are already doing a major portion of the work in this area by collecting data that make it possible to define all sorts of social and demographic problems. Physicians must assume the leadership in providing each patient with a total list of problems, irrespective of who in the medical hierarchy provided the data, and in seeing that therapeutic action reflects some perspective on the total needs of the patient.

When large amounts of demographic data are developed, by means of the computer, a system could be developed whereby input of certain vital statistics on any patient would automatically result in an immediate print-out of his main demographic problems along with the current approaches to their management.

Those who provide total care or who are trying to learn how to provide it, and who naturally integrate findings into well formulated problems should not, and usually do not, feel threatened by a request for a complete list. The specialist who is annoyed or made anxious by health issues in his patient beyond the limited area of his mastery may feel threatened by this strict accounting. Through physicians' inefficiency in getting a broad data base, their past neglect of good record-keeping habits and their neglect of quantity of care as they have pointed with pride to quality, they have almost lost their capacity to handle rationally or even to define large-scale tasks of health care.

Implications of the Problem-Oriented Record

The structured, problem-oriented medical record provides a focus for constructive action in a variety of "trouble" areas in medicine: medical problems dealt with out of context; inefficiency in medicine; lack of continuity of care; inapplicability of "basic science" facts and principles; "off-the-cuff" and undisciplined rounds and conferences; and, finally, meaningful audits in the practice of medicine.

PROBLEM LIST

ACTIVE PROBLEMS	RESOLVED PROBLEMS
#1 Accelerated hypertension Retinopathy Renal Disease	
#2 Hypokalemia – etiology to be determined	
#3 Vomiting – dehydration (CVP – 0, Hct 40)	
#4 Diarrhea – unknown etiology	
#5 Anemia, 2° to renal disease (Problem #1) (Hct normally 30)	
#6	Remote peptic ulcer disease
#7	Cholecystectomy
#8 Exogenous obesity	
#9 (L) Breast mass	
#10	Hx of chronic alcoholism
#11	Hx of GC rxed
#12	Personality disorder
#13 Decreased vision (R) eye possible Central retinal artery occlusion	
#14 Cardiac (M), continuous. Never before described ⟶ Chest wall flow murmur 2° to Problem #9 (PN 12/4/67)	

FIGURE 6. *List of Problems on a 36-Year-Old Woman.*

The management of Problem #3, the dehydration, dramatically improved Problem #1, the accelerated hypertension. The volume indicators and other appropriate variables were followed by means of a flow sheet as intravenous volume expanders were given. Aggressive conventional drug therapy of the marked diastolic hypertension out of context could have had serious consequences.

Problems out of Context

Multiple problems may interact, and sophisticated understanding and management of any one of them require a knowledge of at least the presence of all of them. In situations such as the patient with heart failure and azotemia, it is apparent that the right treatment for one may be the wrong treatment for the other, and the need for skillful management is obvious. In other situations the interaction may not be so obvious – as in paroxysmal hypertension, dehydration and hypovolemia[8] (Fig. 6), and physicians are always risking interpretation and treatment of problems out of context. The medical literature is replete with papers on single entities from series of patients (for example, myocardial infarction, cancer of the colon or pneumonia) in which no complete problem list for each patient was systematically presented. A paper may talk about X per cent mortality for perforated ulcer when, for example, what it should really be saying is Y per cent if heart failure is also on the list or Z per cent if another problem or no others are present. Pneumococcal pneumonia alone may well be a different disease from pneumococcal pneumonia in the presence of azotemia. Potent drugs are administered, and major management decisions made for specific problems taken out of context. It is no wonder that controversies in medicine abound; the present lack of technic for the recording and presentation of data on multiple problems almost guarantees chaos.

Until a well conceived problem list is in evidence, so that each is dealt with in context, the fragmentation of care in today's specialty clinics and wards, on rounds and in conferences will never be considered seriously. One must learn how to move easily from a single-minded focus on one problem to attention to the total list and interrelations of multiple problems, much as a biochemist meticulously purifies and studies an enzyme in a scheme of reactions and then returns to consider its relation to the others. He does not, and could not, get basic data on all the enzymes simultaneously in the interest of total biochemistry or the "art of biochemistry," nor does he work on only one and arbitrarily dismiss the others as of little concern. The essential combination of clarifying single problems and integrating multiple problems is greatly facilitated by a medical record that is structured around a total problem list and titled progress notes. Since the body is a complex group of systems, in each of which abnormalities develop that reverberate through the other systems to varying degrees, the specialist, as a responsible scientist, must know the variables in the total system as they affect his specialized judgment and action. A patient's intuitive demand for a "whole doctor" is completely consistent with the demands that good science and knowledge of all relevant factors impose upon the specialist, independently of general discussions of "primary" physicians, total care and humanitarian causes.

Fragmentation of single diagnostic entities resulting from listing separately single related findings is not a legitimate complaint against a complete list of problems. If a complete analysis is done on each finding, integration of related ones is an automatic by-product. Failure to integrate findings into a valid single entity can almost always be traced to incomplete understanding of all the implications of one or all of them. If a beginner puts cardiomegaly, edema, hepatomegaly and shortness of breath as four separate problems, it is his way of clearly admitting that he does not recognize cardiac failure when he sees it. But the important point is that nothing is lost. On the contrary, the interest of more experienced observers is immediately aroused, and some of the patient's problems are combined under a single heading on the original list and are carried one step closer to diagnosis and treatment. The system does not prevent analysis and integration: it merely reveals the extent to which it is performed and it defines the level of sophistication at which the physician functions.

Choice of Problems and Time for Problems

A scientist likes to choose his own problems, determine the time table for action and then spend as much time as necessary. In medicine as now practiced, the patient chooses the problem and initiates the encounter; the physician must react independently of his interests and his moods. Many symptomatic problems demanding immediate care might have had organized care at times specified by a physician in a less acute phase. Since they were never identified in the problem list, they were

never followed systematically in numbered, titled progress notes by the too busy doctor, who was dashing off random notes on the acute episode of some other previously neglected situation. A physician should always consciously look at a patient's complete list of problems on the front of the record. If his time is limited he should select priorities, directing attention to those having the greatest potential for moving into the acute phase. The rule should be: when under pressure, do what you do very well; select the problem wisely; and never do all superficially just to get them done. Then the work reflected in each *titled* progress note can result in a precisely defined building block, and all effort can be cumulative. Lack of time is not a legitimate argument against keeping data in order. Form leads to speed in almost all human endeavors. To the extent that physicians are allowed to study patients and direct therapy in the absence of form (orderly data), they obscure the evidence that reveals whether their actions were or were not complete and justified. We cannot build a sound medical structure on a system that would violate such fundamental rules of scientific behavior on the excuse, "lack of time." Disorganization and inefficiency cost time; the principles of data collection that have been accepted by all other areas in science save time in the long run.

Medical students and physicians can be taught to deal with heavy work loads, set priorities, direct paramedical help wisely and learn efficiency. The medical record is an ideal instrument and focus for achieving these educational goals. We should not assess a physician's effectiveness by how much time he does or does not spend with patients or how sophisticated his specialized technics are. Rather, we should judge him on the completeness and accuracy of the data base he requires at the time he starts his work, the speed and the economy with which he obtains his data for his patients, the adequacy in the formulation of all the problems, the effectiveness of the therapy he prescribes and the total quantity of acceptable care that he is able to deliver.

Lack of Continuity of Care

Lack of continuity of care by the same physician is associated with doctors in training and specialists in medical centers and urban areas to a far greater degree than it is with the community physician with a relatively stable practice. There are many factors that attest to this fact, but the most disturbing is that the chief request of our clinic patients when asked for suggestions about the improvement of their care is in effect, "Could you please fix it so that I won't see a different doctor every time I come? They never really understand, some 'pass the buck,' and they all tell you different things." The second disturbing factor indicating this lack of continuity is the inefficiency that can be directly traced to multiple physicians. Tests are repeated unnecessarily, results are not followed up, and large amounts of time are wasted by both the physician and the patient even when the records are adequate. A physician familiar with a good record kept by himself can make sound judgments and decisions in one tenth the time that a physician unfamiliar with the record requires.

A complete medical record is essential to reliable continuity of medical care, even with the same physician. A complete highly structured, problem-oriented medical record will be invaluable to any physician and is essential to the busy one. A table of contents and a good index facilitate greatly the use of any unfamiliar book.

Basic-Science Training, the Physician and the Medical Record

A great deal that physicians labor over such as the Krebs cycle, phage genetics or membrane theory cannot be applied by them (and often by no one) directly to the complex biologic problems that confront them. The simple quantity of molecular biology and theoretical physiology that is now developing can frustrate and overwhelm anyone if it is not coupled with his research or his continuing development. Since the practice of medicine is a research activity when a clinican deals scientifically with unique combinations of multiple interacting problems, it can be coupled to training in basic science either through the facts themselves or through disciplined approaches to defining problems and handling data.

Collaboration between physicians and basic scientists would occur more frequently if the facts in medical records were structured as they are in scientific documents. It is true, however, that a large body of basic-science facts cannot at present be rigorously correlated with clinical action, and it is also unfortunately true that many basic scientists teaching in medical schools "find it more interesting to explore the fascinating interactions of genetics and chemistry in their uniquely favorable 'non-clinical' material than to bother about 'correlations with' medical and other practical matters."[9] The "infinite elaboration" of details in the laboratory of the basic scientist frequently seems to lead him away from the clinician instead of toward him. Details oriented to specific problems and recorded in an organized manner in clinical charts can do much to make clinical problems attractive to the basic scientist and subject to his advanced technics of investigation and analysis.

Basic-science training could have contributed to clinical performance through the teaching of systematic approaches if the physician had been, as a student, required by the basic scientist to formulate problems and write protocols as well as to perform experiments. It is this capacity to formulate and pursue a problem that distinguishes a good clinician, and a teacher of basic science has failed the physician if he does not teach this discipline but merely dispenses facts through lectures and "cookbook" experiments.

There is one fundamental aspect in the preparation of the physician that the basic scientist is not prepared to teach, Basic scientists are themselves taught to choose and focus on a single or limited number of problems, and they teach neither the philosophy nor the technic for coping with the multiplicity of problems that patients inevitably present. The failure of clinical teachers to develop and articulate an approach to multiple problems has led to a serious discontinuity in the scientific training of the physician. The chaotic medical record is a symptom of this philosophical blind spot. The degree to which we organize the record and elevate it to the level of a scientific document will be a measure of our capacity to develop and teach a workable philosophy of multiple problems.

Medical Rounds and Conferences

In earlier times bedside and autopsy-table teaching predominated, and most of the data used in the discussion were acquired at the bedside. This was a marvelous mechanism to keep physicians and students anchored to the realities of their patients' problems. At present, even though some teaching at the bedside has continued, the collection of data is no longer done exclusively by the physician, and discussion is often a ritual taking place from memory and at random rather than from highly organized problem-oriented manuscripts. This is usually a positive deterrent to rational progress in total patient care. No good scientist would make a judgment or even a recommendation on a single oral presentation of data, nor would he fail to follow up the result. On serious problems scientists usually study their data carefully before meeting with anyone. No scientist would seriously consider medical rounds as frequently conducted as good science, good care or good education. To those involved in care and education, multiple typed copies of well organized problem-oriented records must be at all times available for study and could be the basis for a major change in attending teaching rounds. Such rounds will require that the attending physician study the data beforehand; time that is now spent in presenting cases, determining what went on and giving random displays of erudition will be spent instead in analyzing and criticizing and redirecting the recorded efforts of the physician in solving the patient's problems. The young physician should be taught to anticipate and indeed enjoy such analyses for the rest of his life.

We should be allowed the luxury of conferences, grand rounds or a clinicopathological conference only when the original data are in good order and completely and carefully presented, but certain educational goals cannot be met by this means. How many teachers of medicine labor under the delusion that they can convey to physicians in one hour or a grand rounds the factual content or the wisdom of their 10, 20 or 30 years of personal experience and evolution in a field? A more realistic goal in teaching is to discipline the physician in the most effective application and growth of his own developing store of factual information through his own disciplined study of actual cases. The computer can make an enormous contribution in this area.* Problem-oriented medical records can be made easily accessible to authorized individual physicians or participants in a medical conference, who can then be expected to study the patient's data and analyze the list of problems, the plan and *the progress notes*.† Typed summaries of cases containing only selected data are not sufficient for rigorous analysis and medical education.

It is true that this could be and is being done now at this institution on manually constructed problem-oriented records, but the computer will allow immediate retrieval of all the data in sequence on any given problem, graphic representation of data and relations, multiple copies at distant terminals (also used for teaching rounds) and immediate correlation with large amounts of data on similar problems already stored in the computer. Furthermore, when many institutions have similarly developed data banks of patients' records, they can teach and audit one another.

Since the aim is to have the records of current patients readily available, the individual physician or members of a conference can question the doctor in charge of the patient for clarification, pointing out errors or shedding new light on the problems. They may be able to suggest additions to the data base, offering alternatives to the formulation of the problems and the approaches to handling them. By this means a link is forged between education, audit and patient care. Every time someone gets education, a physician will be audited, and at every audit a patient may get better care.

There are those who fear that rigid adherence to the patient's problems will emphasize only the physician's practical knowledge and development and create a tradesman who is dated with the technical expertise of an era, unable to meet new situations in a changing world. The approaches described here will demand of both faculty and student clear thought, a research attitude and a "willingness to apply first principles" to the new situations inherent in the infinite variety of combinations of multiple interacting medical problems. Biologic realities, honestly confronted, facilitate rather than hinder scientific advance. This is the art of medicine.

Lack of Regulatory and Feedback System on the Physician's Own Work

There is no audit by outside authorities on each piece of work as it is completed analagous to what is done in basic science. Basic scientists are

*The computer-science aspects of these developments are under the direction of Mr. Jan Schultz.

†Mr. Robert Esterlay is investigating technics whereby actual rather than contrived problem-oriented medical records can be used as a major source of teaching material for computer-assisted learning of the medical student.

monitored by a system that mobilizes the criticism of their peers. Clinical medicine, on the other hand, has tried to substitute qualifying examinations at a single point in a career for a recurring, lifelong audit on each piece of work as it is completed. The strategy and completeness of the physician's own search for data, the depth of analytical capacity in theoretical understanding and therapeutic decisions and the capacity for sustained quality and energy in his daily attack on problems, both esoteric and mundane, are poorly evaluated by any examining procedure that is done at just one point in a physician's career and uses case material besides his own.

Professors of clinical medicine and practicing physicians must be provided with the advantages of an audit whose origin is independent of their own organization.

The medical record can be used in the solution of this audit and feedback problem if we accept certain basic premises:

Premise (1). All the data in the medical record must be identified with a problem to determine whether the data are fundamental to solving the problem and whether factors such as redundancy, unnecessary delays and unjustified decisions are present.

Premise (2). All the data on any given problem must be easily retrieved in sequence and in a completely up-to-date fashion (for example, x-ray and laboratory data must be in the record as soon as they are available). The data are then immediately available to the staff members responsible in a given specialty area for determining whether certain standards for quality are being met. At the outset the staff member will use the same criteria he has always used to assess the quality of management in his area. Eventually, as the data bank grows in both number of patients with a given problem and numbers of variables followed and recorded, new standards for reasonable numbers of tests and good care will emerge.

Premise (3). Development of standards for quality of patient care as outlined in premise (2) may evolve easily when a patient has one or several unrelated problems. Conclusions will be more difficult when there are multiple concomitant problems in the same patient (such as cardiac failure, renal failure and malnutrition) the final solution of any one of which is intimately related to the progress on the others. In these particular cases fixed standards of care do not apply, and quality must be determined on an individual basis within a framework of generally accepted principles. The doctor's role in cases of this type may well be likened to that of an analogue computer, which plots specific points on a curve as a function of the time and type of input and the shape of the curve is not known until the input stops.

Premise (4). The dimensions of the quality-control problem alluded to in premises (2) and (3) can never be assessed until computerization of the data is accomplished. Manual approaches have not, after all these years, resulted in a widely applicable and practical appraisal. It is through discipline, and rapid effective audits and their demands for explicitness in the definition of problems and the orderly organization of the data that computers could make their main contribution to the performance and development of physicians. Physicians will be able to respond more constructively as soon as we give them a total picture of what it is that they are doing for specific problems.

The justification for a reorganization of the medical record by identifying all data with a problem is not and cannot be based on any proof that it will in itself guarantee improved quality of care and education. Titles, chapters and indexes in books, well thought out classification systems in organic chemistry and well established rules for presenting data in scientific manuscripts do not guarantee high quality of the material, and no one expects them to in and of themselves. But neither does anyone expect to use the book, work in the chemical field or referee manuscripts if it is up to him to take a mass of incomplete and randomly presented data and organize it before he can even start to deal with the matter of quality. It is hard for nonmedical scientists to believe that we have allowed for this long the chaos in everyday medical data because scientists do not usually write papers on several problems simultaneously as doctors do; they have assumed that physicians have a system and immediately go to the second order of business, which is questions about quality of care. But we have not had a system for progress notes on multiple problems, and we therefore should first find it necessary to organize the record as a *basis for beginning* the development of a program of quality control. The basic premises stated above have grown from my convictions that it is already accepted in the field of science that all data should be recorded at the time it is acquired and that before it is submitted for analysis and inclusion in the literature of the field, it should be organized and presented in relation to the problem the data are purported to solve.

There may be considerable urgency in these matters, because large amounts of money have already been spent and allocated to the computerization of single components in the hospital complex such as laboratories and pharmacies, with little regard for problem orienting of data and decisions. This proliferation of automated systems within parts of a hospital complex without provisions for a central role for patients' problems make future evaluation of all these expensive efforts difficult. Such automation may be making highly efficient and accurate specific tests and maneuvers, but often it could merely be facilitating rapid action that is not necessarily solving the patient's problems. Daily reporting of an accurate chemical value, for example, has no particular virtue if the problem at hand requires only a weekly determination or no such determination at all. Some of the most advanced

and most expensive automation of laboratories today is not coupled with an equally sophisticated problem-oriented clinical situation, and the value of these sophisticated efforts in terms of patients' problems can never be assessed. Laboratories have relied on the assumption that all determinations that are ordered are indicated, and the frequency of given determinations is never overdone, and what is worse, much money has been spent on systems that were never designed to test this crucial assumption.

At present no system is available whereby a medical teacher or member of an accrediting agency can take a patient's record at random, select one of the patient's problems, see all the data pertinent to that problem in sequence and immediately ascertain whether current medical standards are being applied. Such an inordinate amount of time is now being spent determining what was or was not done, and for what purpose, that on a time basis alone a teacher or auditor is rendered ineffective, and abuses may go uncorrected.

Also at present the details of the relation between patients' problems and hospital resources and costs are very obscure. A medical record maintained by the technic described will make possible a fiscal management audit in which utilization of hospital resources and services involved in the care of the patient are a matter of the medical record and can be identified with each specific problem presented by the patient. This combination of facts (clinical problems, hospital resources and costs) will enable the hospital to establish a dynamic unit cost-accounting system similar to that employed by more sophisticated industries. The advantages of such a system have broad and favorable implications for the general management of a hospital in the areas of fiscal planning, organization of resources, measurement of efficiency and daily management of the institution.

Art in Practice of Medicine

It has been said that preoccupation with the medical record and the computer leads to neglect of the "humanitarian" side and the "art" of medical practice. The most humanitarian thing a physician can do is to precisely know what he is doing, and make the patient as comfortable as he can in the face of problems that he cannot yet solve. There have been major humanitarian and sociologic failings in medicine, but almost all of them can be attributed to our poor behavior as scientists as we have dealt with problems out of context and ignored data relevant to good medical care. It is true that no system will make one kind, thoughtful or sympathetic, but to say that the art of medicine is not dependent on a great deal of discipline and order is to miss perhaps the true understanding of what underlines art in any form. Words of Stravinsky might be applied to our situation: "Human activity must impose limits upon itself. The more art is controlled, limited, worked over, the more it is free." If we accept the limits of discipline and form as we keep data in the medical records the physician's task will be better defined, the role of paramedical personnel and the computer will be clarified, and the art of medicine will gain freedom at the level of interpretation and be released from the constraints that disorder and confusion always impose.

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