INTERMED: A method to assess health service needs: I. Development and reliability

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"INTERMED": A Method to Assess Health Service Needs

I. Development and Reliability

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Abstract: *The purpose of this paper is to describe the development and to test the reliability of a new method called INTERMED, for health service needs assessment. The INTERMED integrates the biopsychosocial aspects of disease and the relationship between patient and health care system in a comprehensive scheme and reflects an operationalized conceptual approach to case mix or case complexity. The method is developed to enhance interdisciplinary communication between (para-) medical specialists and to provide a method to describe case complexity for clinical, scientific, and educational purposes. First, a feasibility study (N = 21 patients) was conducted which included double scoring and discussion of the results. This led to a version of the instrument on which two interrater reliability studies were performed. In study 1, the INTERMED was double scored for 14 patients admitted to an internal ward by a psychiatrist and an internist on the basis of a joint interview conducted by both. In study 2, on the basis of medical charts, two clinicians separately double scored the INTERMED in 16 patients referred to the outpatient psychiatric consultation service. Averaged over both studies, in 94.2% of all ratings there was no important difference between the raters (more than 1 point difference). As a research interview, it takes about 20 minutes; as part of the whole process of history taking it takes about 15 minutes. In both studies, improvements were suggested by the results. Analyses of study 1 revealed that on most items there was considerable agreement; some items were improved. Also, the reference point for the prognoses was changed so that it reflected both short- and long-term prognoses. Analyses of study 2 showed that in this setting, less agreement between the raters was obtained due to the fact that the raters were less experienced and the scoring procedure was more susceptible to differences. Some improvements—mainly of the anchor points—were specified which may further enhance interrater reliability. The INTERMED proves to be a reliable method for classifying patients' care needs, especially when used by experienced raters scoring by patient interview. It can be a useful tool in assessing patients' care needs, as well as the level of needed adjustment between general and mental health service delivery. The INTERMED is easily applicable in the clinical setting at low time-costs.*

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Introduction

In his classic 1977 treatise, Engel called for a conceptualization of medical patients in which psychological and social aspects of their illness experience are included [1]. Evidence suggests that there are

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important service delivery considerations to this comprehensive understanding of patients. Up to 30% of the patients in general hospitals suffer from clinically relevant psychiatric comorbidity [2]. Depending on level of service delivery (outpatient-inpatient) and type and stage of disease, this percentage increases [2–4]. Patients with psychiatric (co)morbidity have a high level of functional impairment [5], stay longer in the hospital [6], and utilize more medical services [7–10]. Though the cost-effectiveness of social, psychological, and psychiatric interventions in treating these conditions has been demonstrated in several randomized and meta analytical studies [11–16], the implementation of consultation-liaison (C-L) psychiatry within the general hospital in many countries is still a matter of debate [17,18].

In the two decades since Engel's call, significant barriers to fully embracing a biopsychosocial model of care continue to exist within the health care system. Three barriers stand out as particularly significant. First, it has been difficult to operationalize the proposed biopsychosocial model in a clinical meaningful way. Lobo recently pointed to the importance of McHugh's work [19]. McHugh criticizes its broadness and nonspecificity and therefore considers the model "heuristically sterile." Second, communication across specialties is often difficult and unstructured. For example, psychiatry and social services use different language and ways of thinking about patients than do surgery and internal medicine services. Third, administrative planning and case management require tracking of clinical aspects of patients. To date, information systems have focused on patient demographic and diagnostic information. Consistent, reliable information on psychological and social aspects of a case are not routine information in hospital databases nor is the intensity of prior health service utilization. Consequently, doctors, health service researchers, and policy planners have little integrated psychosocial information available, therefore the above-mentioned effectiveness is, at great costs, largely ignored.

This paper proposes the INTERMED method for assessing past, present, and future health service needs. It attempts to address these three barriers in order to actualize Engel's message and thereby provide an operational method to systematically integrate psychological and social "case-mix" factors in the health care planning of patients as well as the subsequent needed level of mutual adjustment of the care providers.

Rationale

In an increasingly managed health system, it is important to balance the clinical needs of patients with the utilization management and cost containment objectives of health care payers. In order to accomplish such a balance, those clinical characteristics that are related to decisions on type, setting, and duration of treatment, often called "case-mix" [20], should be identified. Elsewhere, we have developed strategies for designing case-mix measurement based on decision-making processes of acute psychiatric services [21,22]. This measurement strategy has focused on measuring the conceptual clinical underpinnings to decision making in acute psychiatric service settings. The present project extends this methodology to a medical setting based on a conceptual, clinical understanding of the multidimensional nature of patient health care needs [23]. The development and reliability of the INTERMED is described here. The results of the assessment of its validity are described in a twin paper [24].

Development and Description of the INTERMED[1]

Although attempts have been made to develop an instrument such as the one described above, there have been none that have been applicable for patients with different diseases or widely accepted and implemented [25,26]. Consequently, a need exists to develop such an instrument; it should be 1) reliable—communication depends on all participants using language in identical ways; 2) valid—profiles and scores on the instrument should have meaning regarding the type and duration of treatment and the level of care at which treatment is provided; 3) brief—medical professionals will not use time-consuming measures; and 4) flexible—it should be possible to be used in all health care settings.

Over the past years, a biopsychosocial grid, including the health care system as an important separate system to be considered in the analyses and treatment planning of patients, has been developed for teaching, clinical use, and research in C-L psychiatry [27]. The extension of Engel's original biopsychosocial conceptualization of patients was thought to be useful to describe the intensity and

[1] For reasons of conciseness, the INTERMED described here includes the results of the reliability studies described below.

quality of the patient's health care utilization in terms of previous and current experiences and in prognoses relevant to treatment planning. Taking the more operationalized methods proposed by McHugh [19,28] into account, this grid has been combined with measurement strategies that allow the creation of a case-mix-, decision-support and outcome-management tool: the INTERMED [21,22].

The INTERMED synthesizes data from four systems: 1) the biological, 2) the psychological, 3) the social, and 4) the health care system, assessed in the context of time (history, current state, and prognosis). Within each of the resulting domains, two pertinent variables were chosen on clinical and/or scientific grounds known to be important for each of the domains, representing an indicator for the past, current, or future needs in this domain. Each of the variables of the different domains have to be scored according to a defined scoring system, ranging from a score of 0 (no vulnerability or need) to a score of 3 (high vulnerability or need) (Table 1).

History

Biological System. This domain contains information about the chronicity and periods of diagnostic uncertainty. The distinction between acute and chronic diseases has been proven to be helpful for the conceptualization of somatic diseases and the patient's medical needs, specifically in the elderly [29]. Also, the prevalence of psychiatric disturbances in chronic patients is high [5]. In addition, diagnostic uncertainty, especially when reflected in multiple testing and when contradictory diagnoses of the past indicate the possibility of a depressive, anxiety, or somatoform disorder, is an indicator for the demands and medical needs of a patient [5,8,9,16,30,31].

Psychological System. This domain contains information about past coping resources and psychiatric history. Both are related to impairment of compliance, affects and cognition, substance abuse, the expression of functional physical symptoms, and behavioral disturbances including somatization. Patients with such disturbances or vulnerabilities have increased health care needs [5–10]. As psychiatric morbidity has a tendency to chronicity, these two variables are most predictive for the patient's psychological vulnerability and future adaptation to his disease and subsequent medical and psychological needs.

Social System. This domain contains information about family environment and patient's social network. Social network, social stress, and social support, especially in regard to the family, have been extensively proven to be of great importance for the adaptation of a person to somatic illness and reflect the patients social needs [32,33].

Health Care System. This domain contains information about intensity and adequacy of prior care. A patient's health care utilization during prior illness episodes, and the quality of his past relation-

Table 1. INTERMED domains and variables

Domains	History	Current state	Prognoses
Biological	Chronicity	Severity of illness	Complications and life threat (short term)
	Diagnostic uncertainty	Clarity of diagnostic profile	(long term)
Psychological	Restrictions in coping	Treatment resistance	Mental health threat (short term)
	Premorbid level of psychiatric dysfunctioning	Severity of psychiatric symptoms	(long term)
Social	Family disruption	Residential instability	Social vulnerability (short term)
	Impairment of social support	Impairment of social integration	(long term)
Health care	Intensity of prior treatment	Organizational complexity at admission or referral	Care needs (short term)
	Prior treatment experience	Appropriateness of admission or referral	(long term)

ships with the health care system, are likely to influence current and future needs [8–10,34].

Current State

Biological system: This domain contains information about the severity of physical symptoms, the patients functional capacities, and complexity of the diagnostic profile. These variables are related to the intensity of current diagnostic and therapeutic medical needs [20].

Psychological system: This domain contains information about resistance to treatment and severity of psychiatric symptomatology (Table 2). Compliance and psychiatric co-morbidity are both crucial for the outcome of medical illness [35].

Social system: This domain contains information about residential stability and social integration, including vocational impairment. All influence social adjustment to a disease, adjustment after recovery, and influences the organization of care.

Health care system: This domain the organizational complexity in terms of number and types of health care providers is described, reflecting both the intensity and complexity of the actual health services delivered. Here also the appropriateness of transitions of care such as referral and hospitalization is scored. These variables take into account current splits of health care systems—primary vs secondary and general vs mental health care—and the fragmentation of the secondary health care system reflected as well as effects on transitions of care.

Table 2. Severity of psychiatric symptoms (INTERMED: psychological domain; current state)

0	Indicates a person without psychiatric symptoms or one whose psychiatric symptoms are currently in remission
1	Indicates a person who has mild psychiatric symptoms (e.g., problems with concentration or feeling tense), yet there is no direct need for professional assessment and treatment
2	Indicates a person with moderate psychiatric symptoms (e.g., depressive symptoms or somatization) that would necessitate treatment with a mental health specialist
3	Indicates a person with severe psychiatric symptoms, such as agitation, suicidal threat, depression, mania, phobia, functional psychosis, delirium, or dissociative disorder with automutilation
U	Information is unavailable

Prognosis

Biological system: This domain contains anticipated complications, recurrence of disease, or life threat resulting from the present or past illness episodes. All are of major importance for the future medical needs of a patient.

Psychological system: This domain contains information about the anticipated mental health threat and psychological needs that may result from the current episode or the past psychiatric history.

Social system: This domain contains the anticipated social needs in regard to the social integration of the patient. This becomes most important in patients with changes in their physical and psychological status, resulting in social disintegration or isolation, or in social changes resulting in excess health care utilization [32].

Health care system: This domain contains the anticipated health care needs of the patient formulated in terms of intensity and complexity of its organization. The health service needs on the different system levels (bio-, psycho-, and social) are accumulated and depending on their anticipated mutual influence, the degree of the integration of health services is reflected.

Reliability of the INTERMED

The INTERMED is considered to be a clinical classification system enhancing communication between health care professionals. It is therefore important to obtain information on the extent to which different raters score the same patient similarly, i.e., on interrater reliability. A high interrater agreement is important, as one of the main goals of the instrument is to provide a common language for different medical professionals. In a multicentered, international study we have demonstrated that the interrater reliability of an instrument rating clinical variables is high and requires restricted training [36].

We opted for a research strategy consisting of a preparation study and two reliability studies. The

main goals of the preparation study (N = 21 patients) were to decide on possible scoring procedures and the feasibility of the INTERMED. It included double scoring of patients and discussion of the results. This led to a version of the instrument on which two interrater reliability studies were performed. The studies were conducted sequentially which provided the possibility of improvements of the instrument between the studies.

Design

Both studies have been conducted at University Hospital Vrije Universiteit Amsterdam, which is a supraregional trauma center with oncology as the main field of research. It has the complex case mix of a supraregional teaching hospital in a city area with a high percentage of elderly and a low percentage of drug addicts. In study 1, after attending a training in which five patients were scored jointly and subsequently discussed by an internist, a psychiatrist, and a research psychologist, one of both present clinicians interviewed the patient. Afterwards the INTERMED was scored separately on the basis of this interview and information from the medical chart. A series of 14 subsequent, newly admitted patients were scored this way, dependent on their consent and the time schedule of the scorers. The results of the study were analyzed, which led to improvements of the instrument. In study 2, based on medical charts, a psychiatric resident and an intern separately double scored the INTERMED of 16 ambulant patients referred to the C-L psychiatric service; the 16 patients were subsequently admitted outpatients of the resident. Both scorers participated in the preparation study. This scoring procedure is thought to put a heavy strain on interrater reliability as the scorers base their judgments on different sources of information. The results of this study were analyzed and led to the definitive version of the INTERMED.

Data Analysis

As the variables are scored on ordinal scales from 0 (no vulnerability or need) to 3 (high vulnerability or need), normal Kappas are virtually meaningless and weighted Kappas are at their best equivalent to intraclass correlations [37]. We therefore measured agreement by means of intraclass correlations, rank correlation coefficients, and Kendall's τ's.*(tau's) Together, the agreement measures provide a good picture of the interrater reliability and enable an explanation of agreement or disagreement between the raters. For intraclass correlations we used the formula provided by Hays [38]. We calculated Kendall's τ-b's**(tau-b's) as these account for ties, which are to be expected with four answering categories. When one of the coefficients is 0.50 or lower, we study the agreement or disagreement between the raters by means of bivariate cross-tables. This is a conservative (arbitrary) decision rule, which allows us to improve all potentially poor functioning items.

Three types of problematic items were anticipated, each with different patterns of coefficient values, cross-tables, and ways to improve them. The first group will show not enough distribution, enlarging the effect of differences between the raters (detected especially by low rank correlations and Kendall's τ's). These are the items that have to be studied in other populations or made more sensitive. The second group will consist of items on which there is a consistent rater bias, i.e., one is scoring consistently higher than the other (this is shown especially by low intraclass correlation); this may be indicative of differences in information gathering. The third group are expected to be the real problematic items, to which the above does not apply, and still show considerable disagreement.

Results

Both studies proved that the clinical interview and scoring can be done within 15 minutes by someone experienced with the INTERMED, i.e., by interviewing between 5 and 10 patients. Comparison of the rater's scoring in both studies showed that in 96% of all ratings there are no differences of greater than one point (no difference: 63%; one point difference: 33%). We will discuss the results of both studies separately.

For study 1*(n = 14), (Table 3), intraclass correlations, rank correlations, and Kendall's τ's are presented for all items.

In general, there is a substantial agreement between the raters, however, on 7 of the 20 items significant disagreement does exist (Table 3), notably on three of four prognoses. A discussion with the raters revealed there were unclarities regarding the time span. Specifically, it was not clear if only the present hospitalization, the postdischarge situation, or both should be taken into account. Based on this, we decided to split prognoses into short-term and long-term for the next study (see also discussion). In Table 4, the rating patterns of the

Table 3. Intraclass correlations, rank correlations, and Kendall's τ's for all items (study 1)

	Intraclass	Rank correlation	Kendall's τ
History			
Chronicity	0.98	0.79	0.73
Diagnostic uncertainty	0.86	0.71	0.63
Restrictions in coping	0.94	**0.46**	**0.44**
Premorbid level of psychiatric dysfunctioning	0.97	0.92	0.86
Family disruption	0.93	0.87	0.80
Impairment of social support	0.92	0.84	0.81
Intensity of prior treatment	0.98	0.70	0.62
Prior treatment experience	**0.41**	0.60	0.60
Current state			
Severity of illness	0.90	**0.50**	**0.45**
Clarity of diagnostic profile	0.84	0.82	0.77
Treatment resistance	0.92	0.84	0.80
Severity of psychiatric symptoms	0.62	0.78	0.77
Residential instability	0.88	0.58	0.58
Impairment of social integration	0.98	0.75	0.71
Organization complexity at admission or referral	0.87	0.52	0.52
Appropriateness of admission or referral	**0.26**	0.61	0.60
Prognoses			
Complications and life threat	1.00	0.80	0.76
Mental health threat	**0.49**	0.58	0.52
Social vulnerability	0.80	**0.29**	**0.25**
Care needs	**0.44**	0.51	**0.48**

Items in boldface indicate significant disagreement

Table 4. The rating patterns of four items (study 1)

	Severity of Illness				Restrictions in coping				Prior treatment experience				Appropriateness of admission or referral			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
0	–	–	–	–	4	3	–	–	6	4	–	–	8	–	–	–
1	–	–	1	–	2	3	–	–	–	3	1	–	3	3	–	–
2	–	2	7	2	–	1	–	–	–	–	–	–	–	–	–	–
3	–	–	–	2	–	–	1	–	–	–	–	–	–	–	–	–

remaining four items are presented with significant disagreement.

It can be seen from Table 4 that the main problem has been that on these items the scores are marginally distributed. There were no differences of greater than one point between the raters although the items 'prior treatment experience' and 'appropriateness of admission or referral' show additional consistent rater bias. The anchor points of these items were changed so that they are more sensitive for intersubject variation. As an additional improvement, the possibility of giving "unknown" as an answer was included on the forms, as suggested by the raters.

In study 2 (n = 16), comparison of the ratings by the psychiatric resident and intern shows that in 94% there was no difference of greater than one point (no difference: 61%; one point difference: 33%) which is comparable to the first study. In Table 5, intraclass correlations, rank correlations, and Kendall's T are presented for all items.

It can be seen that 13 of the 24 items show on at least one coefficient significant disagreement. The cross-tables of these items are presented in Table 6. Of the 13 items, five are categorized as marginal distribution items. Notably, three are prognoses. The distinction between short-term and long-term seems to reduce interrater differences (no differ-

Table 5. Intraclass correlations, rank correlations, and Kendall's τ's for all items (study 2)

	Intraclass	Rank correlation	Kendall's τ
History			
Chronicity	0.89	0.75	0.63
Diagnostic uncertainty	**0.34**	0.78	0.73
Restrictions in coping	0.53	0.86	0.81
Premorbid level of psychiatric dysfunctioning	1.00	**0.45**	**0.43**
Family disruption	0.63	**0.50**	**0.41**
Impairment of social support	**0.43**	0.74	0.70
Intensity of prior treatment	0.61	**0.47**	**0.42**
Prior treatment experiences	0.64	0.73	0.69
Current state			
Severity of illness	0.97	0.83	0.75
Clarity of diagnostic profile	0.63	0.77	0.69
Treatment resistance	**0.26**	0.55	0.53
Severity of psychiatric symptoms	0.93	0.58	0.55
Residential instability	0.93	0.50	**0.48**
Impairment of social integration	0.64	0.77	0.73
Organizational complexity at admission or referral	**0.31**	**0.23**	**0.21**
Appropriateness of admission or referral	**0.38**	**0.07**	**0.06**
Prognosis			
Complications and life threat (short term)	0.72	0.84	0.82
Complications and life threat (long term)	0.76	0.91	0.87
Mental health threat (short term)	0.95	**0.42**	**0.37**
Mental health threat (long term)	0.84	**0.39**	**0.36**
Social vulnerability (short term)	0.92	0.92	0.91
Social vulnerability (long term)	**0.42**	0.73	0.70
Care needs (short term)	0.70	**0.37**	**0.35**
Care needs (long term)	0.67	0.53	0.50

Items in bold face indicate significant disagreement

ences greater than one point) but also reduces interindividual differences. The other two marginally distributed items reflect problems that do not occur frequently (but if they do occur they may strongly complicate care delivery). Three items were categorized as rater biased items, which is due to the scoring procedure. An implication of this is that information on past diagnostic complexity and treatment resistance should be collected by means of an interview with the patient. Of the five problematic items, family disruption and appropriateness of admission or referral are hard to score from the chart. Of the remaining three items, improvement in the clinical anchor point was made.

Discussion

In both studies there was considerable agreement between the raters, although there were clear differences. The highest proportion of agreement was found in study 1, reflecting that scoring here was based on a joint interview and that it was done by experienced clinicians (a senior psychiatrist and an internist). As in clinical practice, the INTERMED will be used mostly in the form of an interview; the findings strongly support the INTERMED's feasibility and usefulness. Based on the results of both studies, several changes in the INTERMED have been made.

Timeframe

The period "past" has been restricted to the last 5 years, with an exception for the variable premorbid level of psychiatric dysfunctioning, which reflects a lifetime perspective. Consequently, child abuse and neglect have been rejected as a part of the variable "Family Disruption." Although the importance of the family environment, especially in regard to child abuse and neglect, and its correlation with increased health service needs has been documented [39], it has been decided to avoid these

Table 6. The rating patterns of 13 items (study 2)

Marginal distribution

	Residential instability				Organization complexity at admission				Long-term social vulnerability				Long-term care needs				Short-term mental health threat			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
0	7	1	1	–	–	–	–	–	3	2	–	–	–	–	–	–	–	–	–	–
1	1	4		–	–	–	3	1	–	8	2	–	–	–	1	–	–	3	3	–
2	–	1	–	–	–	1	2	4	–	–	1	–	–	1	8	3	–	4	2	1
3	–	–	–	–	–	–	2	3	–	–	–	–	–	–	1	2	–	–	1	2

Rater bias

	Diagnostic uncertainty				Impairment of social support				Treatment resistance			
	0	1	2	3	0	1	2	3	0	1	2	3
0	4	–	–	–	–	–	–	–	–	–	–	–
1	–	1	–	–	4	4	–	–	–	3	–	–
2	2	1	3	–	–	–	1	1	–	4	4	–
3	–	–	2	1	–	–	–	–	–	1	–	2

Problematic items

	Premorbid level of psychiatric functioning				Family disruption				Intensity of prior treatment				Appropriateness of admission or referral				Long-term mental health threat			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
0	–	–	–	–	3	–	–	–	1	1	2	–	3	2	–	1	–	–	–	–
1	–	1	1	–	–	–	1	1	–	2	1	–	4	–	–	–	1	4	2	1
2	1	1	9	2	–	2	3	–	–	–	5	1	3	1	1	–	–	3	2	2
3	–	–	–	1	–	1	2	1	–	–	2	–	–	–	1	–	–	–		1

pertinent questions in a screening interview by restricting history to the last 5 years. The results of earlier social disturbances, when relevant for the patient's health service needs, are assumed to be reflected in other variables. "Prognoses" (Table 5) is split into short-term and long-term health service needs. This provides the option of assessment for inpatients at admission and at discharge; for outpatients, at referral and after a period of 3 months of treatment. For admitted patients on the social system level this implies that the short-term prognosis reflects the expected (dys)integration of the patient on the hospital ward.

Content

The variable Psychological adjustment to physical and social condition (Psychological System Current State) has been deleted and changed for Treatment Resistance. The variable Access to health care (Current State Health Care System) has been revised into Appropriateness of Admission or referral, as this variable reflects more explicitly the problems current health service providers might have in treating the patient instead of making a judgment on the appropriateness of access to earlier delivered care. A description of the organizational complexity of the network of health care providers has been added. In general, the clinical anchorpoints of several variables have been adjusted. More specifically with regard to the variables of the Health Care System Prognosis, special caution has been taken with clinical anchorpoints describing both the intensity and the organizational level required, including the coordination between general and mental health care. Depending on the setting (out- or

inpatient), it varies from standard primary care to outpatient case management or for inpatients from standard ward management, via protocols and consults to co-treatment and case management; the last includes wards with adjusted intensities of psychiatric and medical care: Psych-Med Units [40].

Scoring

The variables in the different domains in the column "Prognoses" are based on the result of the columns "History" and "Current State." The interrelations between the domains are also taken into account and reflected in the prognoses on each system level. In the reliability studies, using joint interviews and chart reviews, raters of different levels of clinical experience have participated and obtained acceptable results. Especially, the reliability of the variables of the prognostic column might be vulnerable to the degree of the clinical experience, which was also reflected in study 2. Therefore, currently, the method is meant to be used by trained clinicians. Future reliability studies should focus on less experienced clinicians and the levels of needed additional training. Future validation studies in different populations and health care settings will probably provide decision rules and guidelines for the variables of "Prognosis."

The INTERMED—a method to assess, summarize, and visualize the past, current, and future health service needs of a patient—is an operationalization of the important conceptual contribution of Engel's [1] biopsychosocial model of disease. In addition, it integrates important aspects of the quality and quantity of the relationship between the patient and the health care system. It is a method developed to complement the traditional medical interview. As a documentation system, the INTERMED can be utilized in different health care settings and could be placed like any other important document in the medical chart. The method can be used for clinical, scientific, and educational purposes as a case mix, a decision support, and as an outcome management tool.

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