Surrogate Decision Making: Do We Have to Trade Off Accuracy and Procedural Satisfaction?

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*Objective. Making surrogate decisions on behalf of incapacitated patients can raise difficult questions for relatives, physicians, and society. Previous research has focused on the accuracy of surrogate decisions (i.e., the proportion of correctly inferred preferences). Less attention has been paid to the procedural satisfaction that patients' surrogates and patients attribute to specific approaches to making surrogate decisions. The objective was to investigate hypothetical patients' and surrogates' procedural satisfaction with specific approaches to making surrogate decisions and whether implementing these preferences would lead to tradeoffs between procedural satisfaction and accuracy. **Methods.** Study 1 investigated procedural satisfaction by assigning participants (618 in a mixed-age but relatively young online sample and 50 in an older offline sample) to the roles of hypothetical surrogates or patients. Study 2 (involving 64 real multigenerational families with a total of 253 participants) investigated accuracy using 24 medical scenarios. **Results.** Hypothetical patients and surrogates had closely aligned preferences: Procedural satisfaction was highest with a patient-designated surrogate, followed by shared surrogate decision-making approaches and legally assigned surrogates. These approaches did not differ substantially in accuracy. Limitations are that participants' preferences regarding existing and novel approaches to making surrogate decisions can only be elicited under hypothetical conditions. **Conclusions.** Next to decision making by patient-designated surrogates, shared surrogate decision making is the preferred approach among patients and surrogates alike. This approach appears to impose no tradeoff between procedural satisfaction and accuracy. Therefore, shared decision making should be further studied in representative samples of the general population, and if people's preferences prove to be robust, they deserve to be weighted more strongly in legal frameworks in addition to patient-designated surrogates. **Key words:** end-of-life decisions; surrogate; proxy; preferences; accuracy; shared decision making* **(Med Decis Making 2014;34:258–269)**

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The right to choose is the hallmark of individual freedom and self-determination. A key goal of a participative health care system is therefore to engage the patient in the process of determining the course of medical treatment.[1] Various medical conditions, however, can rob people of the ability to participate in decisions about their own treatment. In the United States, for instance, as many as 15,000 patients who live in a persistent vegetative state and another 100,000 who are minimally conscious[2] cannot express their preferences in the event of life-threatening complications. Moreover, the dementia caused by Alzheimer's disease—of which there are currently 15 million cases worldwide[3] and the incidence of which is expected to increase 3-fold by 2050[4]—can deprive even fully conscious people of the power to make medical choices, as can severe brain injuries. Although many incapacitated people might choose to receive treatment for

life-threatening medical complications, others might prefer to receive no care or only limited care.[5]

In an effort to respect incapacitated patients' right to autonomy and control, the task of those who make decisions on their behalf is to infer their preferences accurately. Many countries have adopted laws detailing how this process of surrogate decision making should proceed. To the best of our knowledge, however, these laws are not grounded in empirical research investigating the preferences of patients and surrogates. Several investigators have devoted substantial effort to studying the accuracy of different approaches to making treatment decisions for patients who cannot decide for themselves.[6–10] Little attention, however, has been paid to procedural satisfaction, that is, the question of how patients and surrogates would want this decision to be made. Although process preferences and goals in end-of-life decision making were investigated in terms of general values,[11] procedural satisfaction with regard to specific approaches to making surrogate decisions has not been investigated. Consequently, we currently do not know to what extent procedural satisfaction and accuracy are conflicting or compatible goals. We believe that in the interest of evidence-based policy making, knowledge about preferences is as important as knowledge about the accuracy of various surrogate decision making approaches.

Established Approaches to Surrogate Decision Making

How can one best respect the wishes of patients who are no longer able to communicate? Several approaches have been proposed. Many countries[12,13] have laws that allow citizens to complete an advance directive that specifies their treatment preferences in medical situations (*living will*) or empowers a specific person (*patient-designated surrogate*) to make treatment decisions on their behalf according to the *substituted judgment standard*. Living wills, however, are not without serious inherent flaws.[14] First, because they are conditioned on generic medical scenarios, they risk being too vague to be translated easily into decisions in a real, complex medical scenario. In fact, most geriatricians in one study reported that living wills had no effect on their treatment decisions,[15] and living wills seemed not to improve physician–patient communication.[16] Second, unless updated on a regular basis, living wills risk ceasing to reflect a person's current treatment preferences by the time they are invoked. Finally, the reported prevalence of living wills varies widely: A study of

16,678 American decedents found that only 10% had a living will,[17] and a recent investigation in Germany arrived at the same estimate.[18] In other studies, the prevalence within the investigated populations ranged from 20%[5] to 71%.[16]

If no living will and no patient-designated surrogate are available, who makes medical decisions? In several countries (e.g., Switzerland, Hungary, and many US states, including California, Montana, and Nevada), the law assigns a default surrogate using a nearest-relative hierarchy that starts with the patient's spouse and progresses to his or her adult children, parents, and adult siblings.[19,20] In the UK, the Mental Health Act stipulates use of the same hierarchy in the case of mentally incapacitated patients.

Does this legal framework ensure high-quality surrogate decisions? Decision quality in the surrogate context can be measured on 2 dimensions: procedural satisfaction and accuracy. Thus, the objectives of Studies 1 and 2 were to investigate 1) how people would prefer surrogate decisions to be made if they were to become incapacitated or a surrogate, respectively, 2) how accurate different ways of making a surrogate decision are in predicting patients' preferences, and 3) whether procedural satisfaction and accuracy are compatible goals or may require a tradeoff. Before we turn to these objectives, let us introduce an alternative way of reaching surrogate decisions.

An Alternative Approach: Shared Surrogate Decision Making

Through developments in medicine, people are increasingly asked to make painful, high-stake choices for themselves and their loved ones. Although shared decision making by patients and physicians has been widely advocated and many patients wish to be actively involved in medical decisions, some are reluctant to make final treatment decisions,[21] with good reason: Decision-making autonomy often comes with substantial psychological distress. In the context of surrogate decision making, the individual tasked with inferring a patient's preferences may not only struggle with the stress presented by the decision and its consequences but risk landing at the center of a family (if not a legal) dispute: If important decisions are made exclusively by one individual—with other stakeholders having no voice—the perceived procedural satisfaction may be low.[22–24]

The ideal of shared decision making need not be restricted to the patient–physician relationship. In the context of surrogate decision making, sharing the decisions and the responsibility for their

consequences among family members could offer a middle way between the anguish of having to make momentous medical decisions alone and the reluctance to relinquish decision making entirely to another party (e.g., see Harvey and Fischer[25]). Indeed, ''support and others to talk to'' as well as ''working toward consensus'' appear as entries in a list of factors that help surrogates to make these decisions.[26] This also seems to apply to patient-designated surrogates: In one study, 18% of real designated surrogates indicated that they planned to seek input from others in the surrogate's network.[27] Therefore, we propose 2 shared approaches to surrogate decision making that we are going to compare directly to the existing approaches: A decision could be made collectively by the patient's relatives through discussion aimed at reaching consensus or, if that is not possible, through aggregation of the relatives' individual votes using a majority rule.[28]

STUDY 1

In many domains, people care not only about the consequences of their decisions but also about the fairness of the decision procedures.[22,23] In the domain of surrogate decision making, patients' satisfaction with a given procedure may not necessarily map onto that of surrogate decision makers. The objective of Study 1 was to assess hypothetical patients' and surrogates' procedural satisfaction with regard to specific alternative approaches to making a surrogate decision.

Method

In an online study, 618 participants were recruited from a subject pool database of the University of Basel, Switzerland. This database includes participants who were recruited through public advertisements. They were randomly assigned to the role of either a potential patient or a surrogate (i.e., a patient's relative). Table 1 lists participants' demographics. Conducting the study online resulted in a low rate of participation of older individuals (only 2% were 65 years or older). Older people, however, are probably more likely to ponder the prospect of surrogate decisions (as partners or as patients) than are younger people. To find out whether observed preferences in the online sample generalize to older participants, we conducted the same study offline as well. Specifically, we asked 50 participants recruited in retirement homes the same questions (see below) as in the online study. Table 2 lists these participants' demographics. We will refer to the 2 samples as the online sample and the offline sample, respectively.

All participants in the patient role were asked (paraphrased from German; see online material): ''If you were incapacitated at this very moment, how would you prefer an inevitable and vital medical treatment decision to be made on your behalf?'' Participants in the surrogate role were asked the same question, except from the perspective of a surrogate. We then described to participants different approaches to making a surrogate decision (the options were presented in random order; see online material) and asked participants to rank the approaches. Specifically, the treatment decision could be made 1) by the attending physician; 2) by a patient-designated surrogate; 3) by a statistical prediction rule[29] that implements the decision of a majority of similar patients (i.e., an actuarial method); 4) by a hierarchy of nearest-relative surrogates as prescribed by the applicable Swiss law; or by the patient's family in 2 shared decision-making approaches, namely, 5) a family consensus reached through discussion or 6) the family's individual votes combined according to a majority rule.

Results

As Figure 1 shows, the preferences of participants who assumed the role of an incapacitated patient and of those who assumed the role of a surrogate, respectively, are closely aligned with one another. As inference by eye[30] tells, all 95% confidence intervals of hypothetical patients and surrogates overlap and are thus not significantly different (with the exception of the patient-designated surrogate in the online sample). In other words, we found no conflicts between the 2 parties' preferences. Moreover, the order of preferences in the online sample maps onto that observed in the offline sample, suggesting that preferences are largely independent of age (for a detailed analysis, see online material).

The most strongly preferred option in both samples was to have the decision made by a surrogate designated by the patient. Whereas only 10% of participants in the online sample had actually designated a surrogate, 50% of participants in the offline sample had done so. The second and third most preferred options were forms of shared decision making, that is, surrogate decisions made on the basis of a family discussion or a family vote. The least preferred options were to delegate the decision to a physician, to assign a legal surrogate using the nearest-relative hierarchy, and to rely on a statistical prediction

Table 1 Demographic Details of Participants in Study 1—Online Sample				
	Patient Role (n = 331)		**Surrogate Role (n = 287)**	
	$\bar{x}$ (s)	Range	$\bar{x}$ (s)	Range
Age	35 (13)	16–73	36 (14)	15–69
	n	**%**	**n**	**%**
Gender				
Female	245	74	202	70
Male	86	26	85	30
Education[a]				
Nonacademic	171	52	156	54
Academic	160	48	131	46
Income in CHF[b]				
<26,000	148	45	113	39
26,000–52,000	76	23	70	24
52,000–78,000	50	15	50	18
78,000–104,000	40	12	37	13
>104,000	17	5	17	6
Relationship status				
Single	215	65	189	66
Married	73	22	73	25
Other[c]	43	13	25	9
Religion				
None	130	39	100	35
Roman Catholic	92	28	81	28
Protestant	91	27	82	29
Other[d]	18	6	24	8
Religiosity				
Not religious at all	76	32	76	27
	68	28	68	24
	46	12	46	16
Intermediate	39	14	39	14
	27	9	27	9
	21	3	21	7
Very religious	10	2	10	3
Political attitude				
Left wing	27	8	25	9
	83	25	64	22
	77	23	67	23
Center	89	27	81	28
	32	10	34	12
	19	6	13	5
Right wing	4	1	3	1
Residence				
Switzerland	292	88	244	85
Germany	33	10	40	14
Other	6	2	3	1
Completed a living will	49	15	27	9
Designated a surrogate	55	17	38	13

a. ''Academic'' refers to participants holding a university degree.
b. 1 CHF (Swiss Franc) equals 1.07 USD.
c. Separated, divorced, widowed.
d. Jewish, Buddhist.

Table 2 Demographic Details of Participants in Study 1—Offline Sample				
	Patient Role (n = 28)		**Surrogate Role (n = 22)**	
	$\bar{x}$ (s)	Range	$\bar{x}$ (s)	Range
Age	77 (9)	65–100	73 (8)	65–91
	n	**%**	**n**	**%**
Gender				
Female	18	64	12	55
Male	10	36	10	45
Education[a]				
Nonacademic	20	71	10	45
Academic	8	29	12	55
Income in CHF[b]				
<26,000	0	0	0	0
26,000–52,000	2	7	1	5
52,000–78,000	19	68	11	50
78,000–104,000	6	21	10	45
>104,000	1	4	0	0
Relationship status				
Single	5	18	6	27
Married	10	36	6	27
Other[c]	13	46	10	46
Religion				
None	5	18	11	50
Roman Catholic	8	29	4	18
Protestant	15	54	7	32
Other[d]	0	0	0	0
Religiosity				
Not religious at all	4	14	6	27
	3	11	6	27
	5	18	6	27
Intermediate	3	11	1	5
	6	21	1	5
	6	21	1	5
Very religious	1	4	1	5
Political attitude				
Left wing	1	4	2	9
	7	25	4	18
	5	18	2	9
Center	10	36	7	32
	3	11	3	14
	1	4	2	9
Right wing	1	4	2	9
Residence				
Switzerland	28	100	22	100
Germany	0	0	0	0
Other	0	0	0	0
Completed a living will	16	57	15	68
Designated a surrogate	14	50	16	73

a. ''Academic'' refers to participants holding a university degree.
b. 1 CHF (Swiss Franc) equals 1.07 USD.
c. Separated, divorced, widowed.
d. Jewish, Buddhist.

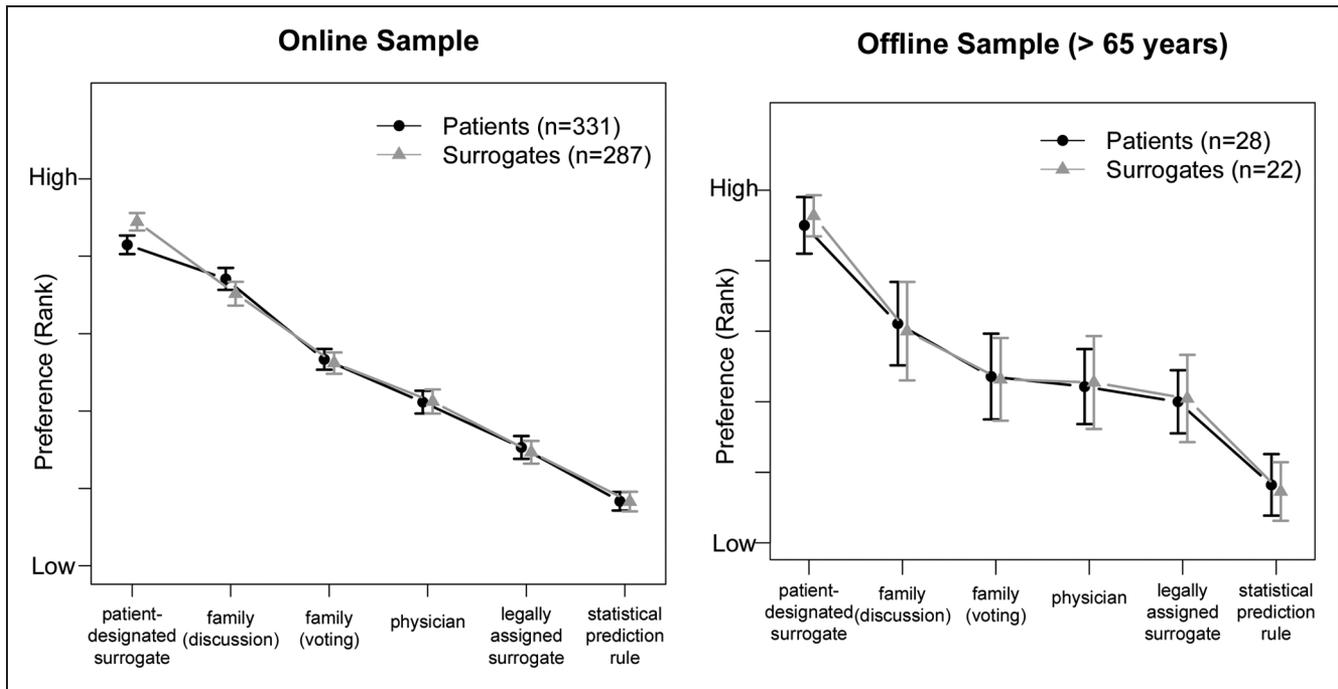**ORIGINAL ARTICLE**　　　　　　　　　　　　　　　　**261**

Figure 1 Preferences (from the hypothetical patients' and surrogates' points of view) with respect to different approaches to making a surrogate decision (error bars show bootstrapped 95% confidence intervals of mean ranks). The left plot shows the results for the online sample and the right plot the results for the offline sample (participants aged 65 years and older only).

rule. Unlike in the online sample, in the offline sample some differences between rankings—in particular the rankings for the options "family (discussion)," "family (voting)," "physician," and "legally assigned surrogate"—were not statistically different (again, the confidence intervals overlap substantially, likely also due to the offline sample's much smaller size). The dismal showing of the statistical prediction rule may be related to patients' general disdain for physicians who use decision aids.[31] The low level of approval for legally assigned surrogates among hypothetical patients as well as surrogates is more surprising given that it is arguably the most frequently implemented form of surrogate decision making. Even though a legally assigned surrogate and the patient-designated surrogate will sometimes be the same person (in Study 2, this happened in 41% of cases), patients as well as surrogates appear to value the right to make the designation themselves rather than delegating it to the law.

A number of reasons suggest that the preference order plotted in Figure 1 is robust. First, respondents in the online and offline sample reported on average the same order. Second, in the substantially larger online sample, the bootstrapped 95% confidence intervals between the rankings in Figure 1 do not

overlap. Third, in a series of exploratory regression analyses conducted to investigate the boundary conditions of participants' preferences (see online material), we investigated whether the preferences could be predicted by the perspective that participants were asked to assume (patient v. surrogate) and by a large set of control variables: age, gender, relationship status (single, married or other), whether participants had designated a surrogate, whether participants had completed an advance directive, religion (none, Roman Catholic, Protestant, or other), self-reported religiosity, education, income, and political orientation. The regression analyses suggest that the preference order reported in Figure 1 holds when also taking into account a large set of control variables. In sum, the observed order of preferences proved to be stable.

STUDY 2

Study 1 showed that in the absence of a patient-designated surrogate, people assuming the role of patients and surrogates alike prefer a collective decision-making approach. What would this mean for accuracy? Aggregation of individual opinions

into a collective vote tends to increase predictive accuracy because nonredundant errors cancel each other out.[32–34] If there is disagreement within the family and a collective surrogate decision cannot be reached informally at the end of a discussion, the family could still benefit from aggregation by casting individual votes and combining them using, for instance, a majority rule.[28] Even if some decision makers do not agree with the outcome, such a shared decision-making approach may make it more likely that dissenting decision makers would perceive the process as fair and therefore accept its outcome.[22,23]

Aggregation, however, has a potential down side. The individual sources of information being aggregated must be sufficiently independent for aggregation to be beneficial.[35] This condition may not be met within families, depriving aggregation of its ability to boost accuracy relative to an individual decision. Worse, if most individual surrogates make mistakes that are highly correlated, then using aggregation could even reduce accuracy. This risk is particularly pronounced in a *hidden-profile* scenario,[36] in which only one person (e.g., the spouse) or a few people have key information and fail to share it with others (e.g., the adult children); in that case, the aggregated judgment (e.g., the aggregated surrogate decision) will be inferior to one made solely by those who have the key information. The goal of Study 2 was to find out whether in the domain of surrogate decision making the benefits or pitfalls of aggregation would prevail.

Method

The accuracy of surrogate decisions cannot be assessed in truly incapacitated patients because their current preferences are by definition unknowable. The most direct and most commonly used[6,37] alternative way to assess accuracy is to elicit people's decisions in hypothetical scenarios similar to those described in living wills. We recruited 64 families in Switzerland through public advertisements in newspapers and other outlets. Table 3 shows the demographic composition of this sample. In each of the 64 families (comprising a total 253 individuals), one person was randomly assigned to the role of a potential patient. In a room apart from her family, this person was asked to imagine being in 8 different health states and then—as if writing an advance directive—to indicate whether she would want to be treated for 3 different medical, potentially life-threatening medical complications (see online material; e.g., "If you suffered an accident that left you in

Table 3 Demographic Details of Participants in Study 2

	Patient Role (n = 64)		Surrogate Role (n = 189)	
	$\bar{x}$ (s)	Range	$\bar{x}$ (s)	Range
Age	41 (17)	15–75	38 (18)	11–78
	n	%	*n*	%
Gender				
Female	35	55	107	57
Male	29	45	82	43
Education[a]				
Nonacademic	42	66	131	69
Academic	22	34	58	31
Person in patient role is				
Wife			14	7
Husband			20	10
Daughter			34	18
Son			15	8
Mother			28	15
Father			31	16
Sister			17	9
Brother			8	4
Other			22	13
Religion				
None	8	13	31	16
Roman Catholic	36	56	99	52
Protestant	15	23	50	27
Other[b]	5	8	9	5
Religiosity				
Not religious at all	13	20	38	20
	11	17	31	17
	11	17	32	17
Intermediate	10	16	29	15
	10	16	33	18
	8	12	16	9
Very religious	1	2	8	4
Completed a living will	2	3		

a. "Academic" refers to participants holding a university degree.
b. Orthodox, Hindu.

a persistent vegetative state and in this state you developed pneumonia, would you want to be treated with antibiotics?"). All other family members acted as surrogates. The surrogates first individually inferred the potential patient's preferences without any interaction or communication with other surrogates. After a break, they jointly discussed the patient's possible preferences and were required to make a final collective surrogate decision for each scenario. For each family, we calculated the proportion of correct predictions yielded by the different approaches to making a surrogate decision.
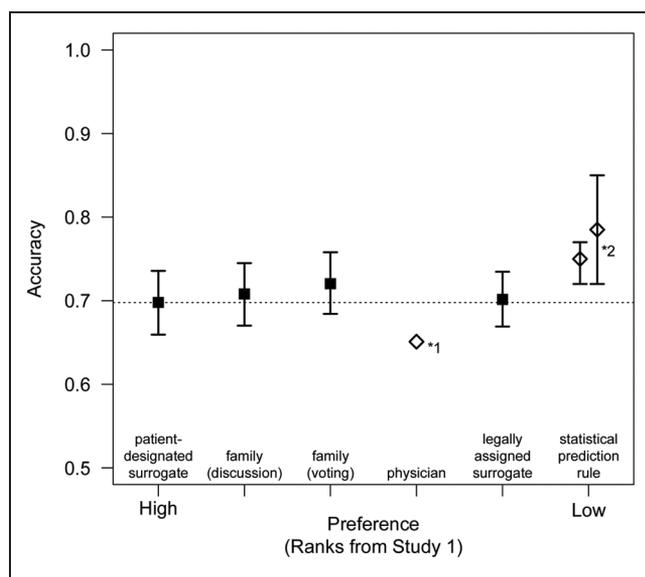
Figure 2 Accuracy (proportion of correctly inferred patient treatment preferences) of different approaches to making a surrogate decision (error bars show bootstrapped 95% confidence intervals of mean accuracy). The dotted line indicates the mean performance of the patient-designated surrogates. 1) Data on physicians' accuracy are from Uhlmann and others,[39] who reported no confidence intervals. 2) Data on statistical prediction rule accuracy are from Smucker and others[9] and Shalowitz and others.[29] See main text for more information about those studies.

Results

The patient-designated surrogates, the option most preferred by potential patients and surrogates alike (cf. Study 1), correctly predicted 68% of the patients' treatment preferences. The second and third most preferred options, having family members reach a shared surrogate decision through discussion or voting, achieved an accuracy of 71% and 72%, respectively. The default surrogates assigned by law (which would be invoked if no living will or patient-designated surrogate were available) performed at 70%. As Figure 2 shows, these 4 approaches to making surrogate decisions did not differ substantially with respect to accuracy (see Note 1 at the end of this article). Although every approach markedly exceeded the chance benchmark (50% correct inferences), none outperformed the others' accuracies by a reliable margin (suggesting a flat maximum, which is characteristic of difficult prediction problems[38]). Even randomly choosing an individual family member's decision would result, on average, in a comparable level of accuracy (67%; confidence interval, 64–70).

We did not examine the accuracy of decisions by a physician or a statistical prediction rule. One previous study of physicians (using similar scenarios) reported an accuracy of 65%.[39] An investigation of statistical prediction rules reported a remarkably high accuracy of 79%, although, as pointed out by the authors, this performance was inflated by the selection of easier scenarios.[29] Another study[9] found that patient surrogates and a statistical prediction rule matched patients' preferences about equally well, with an average accuracy of 74% and 75%, respectively. One problem with comparing accuracy across studies is that the use of different scenarios is likely to contribute to accuracy differences. Therefore, we urge caution in interpreting the accuracies for physicians and statistical predictions rules plotted in Figure 2.

In sum, we found a level of accuracy among family surrogates comparable to that observed in a recent systematic review of nearest-relative and patient-designated surrogates (68%).[8] This deserves mention because earlier research concluded that "when faced with hypothetical decisions about life-sustaining medical care, family members are not able to predict a patient's preferences at levels of accuracy beyond those expected by chance alone."[40] Equally important, our results show that shared decision making does not appear to compromise accuracy. Family members as a group rendered surrogate decisions as accurate as those made by patient-designated or legally assigned surrogates.

Difficulty of scenarios. Not all medical decision-making scenarios—in our study or in real life—are equally difficult. In some scenarios, it is easier to infer a patient's preference because most patients would have the same one. In other scenarios, inferring preferences is difficult because there is no clear modal preference. Figure 3 shows the proportion of "yes" (i.e., treatment) responses made by the hypothetical patients across the 8 health states and 3 complications. There was high variability in treatment preferences across health states. For instance, when a person was assumed to suffer from renal failure, hypothetical patients overwhelmingly preferred treatment, regardless of the kind of complication. When a person was assumed to suffer from a brain tumor (i.e., severe nursing case), hypothetical patients overwhelmingly preferred not to be treated. In still other health states (e.g., coma II), the preferences were equally divided, with half of patients preferring treatment and the other half no treatment. Finally, in some health states there was substantial
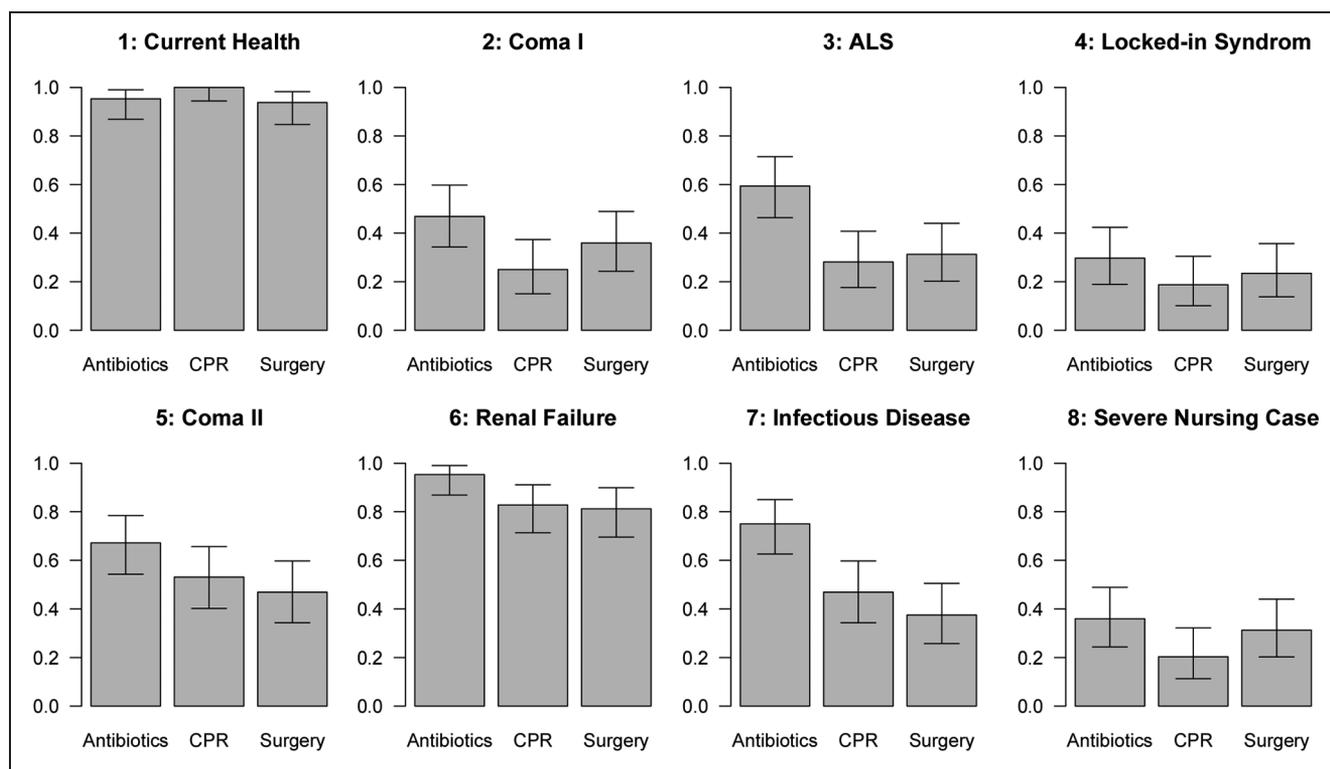
Figure 3   Proportion of hypothetical patients who preferred to be treated in the 24 scenarios (error bars represent 95% Clopper-Pearson confidence intervals for proportions). Panels show 8 different health states and the bars represent the 3 medical, potentially lethal complications (see online material). ALS = amyotrophic lateral sclerosis.

variability, depending on the medical complication. For example, when patients were assumed to suffer from amyotrophic lateral sclerosis, most hypothetical patients would want treatment in the event of an infection but not in the event of heart failure.

In light of this heterogeneity of preferences across medical scenarios, we analyzed the extent to which the performance of the different approaches to making surrogate decisions is a function of that heterogeneity. Are there approaches that deal better than others with difficult or easy scenarios? To this end, we classified the 24 scenarios into 3 sets: The ''treatment set'' included those scenarios in which most hypothetical patients (> 66%) preferred treatment. The ''no-treatment set'' included the scenarios in which most (>66%) preferred no treatment. The ''mixed-preference set'' included the scenarios in which there was no clear majority preference (treatment v. no-treatment preferences ranged between 33% and 66%). Of the 24 scenarios, 8 happened to be assigned to each of the 3 sets, respectively. Figure 4 shows the accuracy of the different approaches across the 3 sets. As in the previous

analysis (Figure 2), we did not find substantial accuracy differences between the approaches. However, accuracy strongly depended on the hypothetical patients' preferences: In the treatment set, all approaches achieved a high accuracy (on average, 85%). In contrast, in the no-treatment set, accuracy was substantially lower (70%), and it was lowest in the mixed-preference set (60%).

These results show that there is no approach that is more accurate in any of the 3 subsets of the medical scenarios. The results also show, however, that all the approaches to making surrogate decisions were more accurate in the treatment than in the no-treatment set. This suggests that the approaches have a systematic treatment bias—leading to more accurate decisions when that bias happens to be appropriate (i.e., treatment set). To investigate this possibility, we conducted a signal detection analysis.[41,42]

Signal detection analysis. Signal detection theory enables us to disentangle discrimination ability d' from response criterion c. Discrimination ability refers to a decision maker's ability to discriminate

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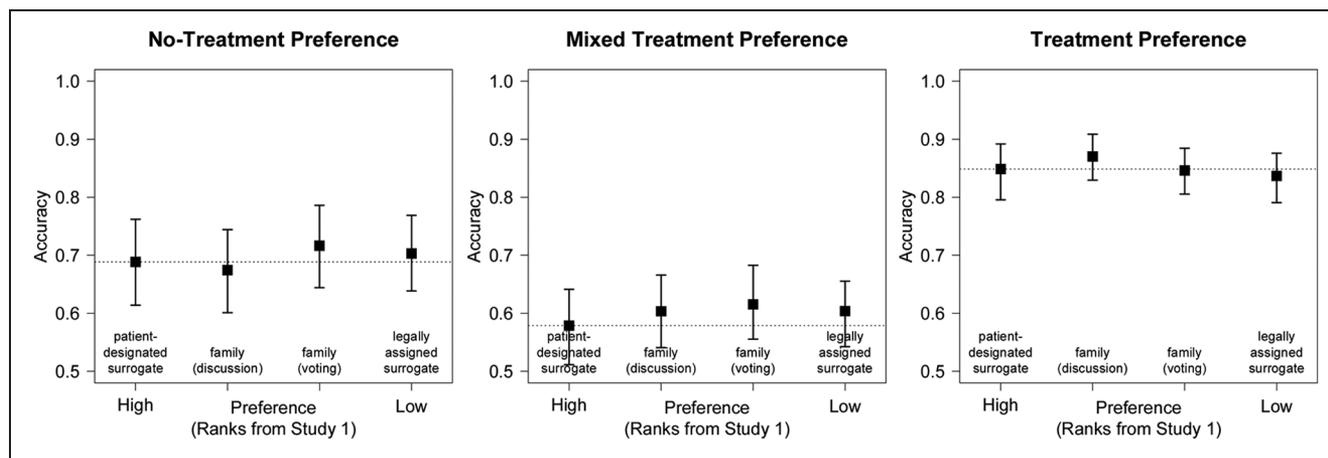
Figure 4 *Accuracy (proportion of correctly inferred patient treatment preferences) of the different approaches, separately for the "treatment preference set," the "no-treatment preference set," and the "mixed-preference set" of medical scenarios (error bars show bootstrapped 95% confidence intervals of mean accuracy). The dotted line indicates the mean performance of the patient-designated surrogates.*

a hypothetical patient's treatment preference (i.e., "signal") from a no-treatment preference (i.e., "noise"). Response criterion refers to a decision maker's tendency to infer either a treatment preference or a no-treatment preference—independent of his or her discrimination ability. That is, a decision maker who can discriminate between treatment and no-treatment preferences (i.e., discrimination ability d' greater than 0) may still be biased toward inferring a "treatment" decision (i.e., response criterion c smaller than 0) or toward inferring a "no treatment" decision (i.e., response criterion c greater than 0).

We implemented a Bayesian hierarchical signal detection model[43] to estimate the discrimination ability d' and the response criterion c of the different approaches. Figure 5 shows that discrimination ability was clearly higher than chance ($d' = 0$) across all scenarios but did not differ across approaches. When restricting the analysis to the difficult mixed-preference scenarios, only the shared decision-making approaches (discussion or voting groups) showed a discrimination ability above chance level.

Response criteria (white bars) were smaller than 0 (i.e., a lenient response criterion) for all approaches, except for the voting groups. That is, when in doubt, all but one approach tended to infer a treatment rather than a no-treatment preference on the part of the hypothetical patient. Only the voting groups had a neutral response criterion. The reason is partly that the majority rule requires a tiebreaker when both options receive the same number of votes in a family. Anticipating that surrogates will have

a tendency to overestimate the prevalence of treatment preferences, we implemented a no-treatment decision as a default in these cases (Note 2).

In sum, the signal detection analysis showed that the different surrogate decision-making approaches reached a similar level of discrimination ability. In the difficult mixed-preference scenarios, however, only the shared approaches performed clearly better than chance. All approaches, except the voting groups, had a response criterion smaller than 0, that is, tended to infer a treatment rather than a no-treatment preference. This may explain why the approaches were more accurate for scenarios with a clear preference for treatment than for scenarios with a clear preference for no treatment.

DISCUSSION

Do policy makers have to trade off accuracy and procedural satisfaction in surrogate decision making? According to our results, the answer is no: Among hypothetical patients as well as surrogates, patient-designated surrogate decision making and shared decision making are preferred over the other approaches. Moreover, these preferred approaches are no less accurate than the other approaches. In light of the indistinguishable levels of accuracy among the available surrogate approaches, we conclude that the dimension of procedural satisfaction should receive more weight in legal frameworks. After all, "empirical evidence suggests that often patients, especially older patients, have a greater
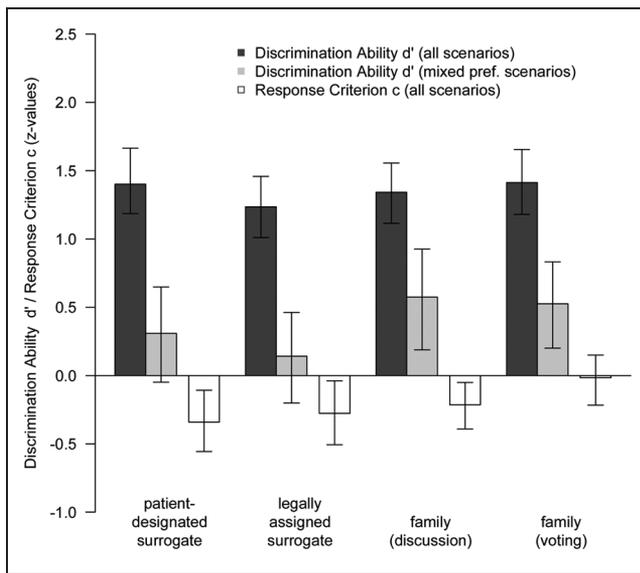
Figure 5 Signal detection analysis: The bars show group means of discrimination ability d′ *and response criterion* c *(z values) of the different surrogate approaches. Error bars show 95% highest density intervals (i.e., ''Bayesian confidence intervals'').*[48] *In addition to conducting the overall analysis, we calculated discrimination ability* d′ *for the 8 scenarios in the mixed-preference set (gray bars).*

concern with who will make decisions for them than with what is decided in a particular situation.''[44]

Policy Implications

How could our findings inform legal frameworks for surrogate decision making? First and foremost, everyone should be ''nudged''[45] to designate a surrogate because this approach is most highly preferred by hypothetical patients and surrogates alike and because the decisions of patient-designated surrogates are no less accurate than the other approaches (although also not better). Second, relying on a physician, a legally assigned surrogate, or a statistical prediction rule appears to imply tradeoffs between people's preferences and decision accuracy, especially in the case of the statistical prediction rule. Although this rule has been shown to have the potential to reach high levels of accuracy[29]—at least as high as that of patient-designated surrogates[9]—it came in last on procedural satisfaction in Study 1. Despite this potential tradeoff, we believe that knowing what life-sustaining treatment choices are made by a relevant group of patients (the foundation of population-based treatment indicators) can be a very valuable input into surrogate decision making (e.g., family discussion). Moreover, providing surrogates

with information about general treatment preferences (i.e., presence or absence of a clear majority preference; see Figure 4) could help them to detect and discuss potential biases in their decisions (e.g., overtreatment bias).

Third, in light of people's high regard for shared surrogate decision making and the fact that it does not compromise accuracy, a legal framework could explicitly acknowledge such an approach in at least 2 ways: In their advance directives, people could be prompted to designate not only a single surrogate but (if desired by the patient) a group of close family members or friends who would be asked to share the burden of making a surrogate decision. Relatedly, people could spell out a group decision rule (e.g., majority rule) for use when the family cannot reach an unanimous decision. In addition, the framework of legally assigned surrogates could be modified such that it encourages all willing and available close relatives of the patient to reach a collective surrogate decision before resorting to the default hierarchy of individual surrogates. These modifications would implement what people expect of surrogate decision making: ''Frequently, families expect that group decision making will be instituted'' and ''Despite the fact family members often prefer to make decisions as a group, legal and bureaucratic structures are oriented toward an individual decision maker.''[46]

Limitations and Future Research

To investigate the accuracy of the different surrogate decision making approaches, we recruited actual families. Within each family, we randomly chose one member to act as a hypothetical patient across a range of simulated medical scenarios. This method, which has been used in previous studies,[6,37] enabled us to gauge the accuracy of the surrogate decisions. It has 2 possible limitations. First, because of the scenarios' hypothetical nature, surrogates may have failed to simulate the gravity of the decision. However, judging from our informal observations, the families were strongly engaged and did not treat the scenarios as toy problems (e.g., some families discussed the decisions for as long as 1.5 hours). But we cannot exclude the possibility that their decisions would have been different had they made a real, consequential surrogate decision.

A second limitation is that the patient's treatment preferences are also hypothetical, derived when she or he was not actually suffering from any of the featured medical conditions. Moreover, treatment preferences are not necessarily stable; they can change

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as a function of the patient's health condition and of time.[40] The problems presented by possibly unstable preferences and preferences elicited using hypothetical scenarios, however, are not unique to our method; they also afflict living wills that draw on hypothetical conditions. Unless regularly updated, living wills risk reflecting the preferences of a previously healthier self—a self that cannot speak for the current self, who faces a life-threatening condition. This may be one reason why many people strongly prefer to designate a surrogate: They may hope that this person will be able to discern the fragility and context-dependency of their treatment preferences, which cannot necessarily be captured by the generic scenarios in living wills.

A final limitation of the present research is that the data on procedural satisfaction rest on 2 different samples that are not representative of the entire (Swiss) population. Future investigation should examine the procedural satisfaction of surrogates and patients using representative samples and in samples of people at higher risk of becoming incapacitated (e.g., nursing home residents). Such investigations could also explore potential intercultural differences in preferences for individual versus shared approaches in societies with a more individualist versus collectivist value system.

CONCLUSION

Making treatment decisions on behalf of others can impose a considerable psychological burden on a person that lasts months or even years.[47] A decision-making process that the patient's whole family perceives as fair may help surrogates cope with any subsequent feelings of guilt, doubt, or grief. It may also help other family members to accept a decision counter to their own opinions, thus mitigating the agonizing disagreements and legal battles that can arise in surrogate decision making contexts. Our findings suggest that shared surrogate decision making constitutes such a process, without sacrificing accuracy for procedural satisfaction.

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NOTES

1. We calculated Bayes factors that quantified the relative evidence for 2 hypotheses: 1) that the performance differences between 2 different approaches do not exceed a small effect size (Cohen's d of 0.2) and 2) that they do.[48] For the smallest difference (legally assigned surrogates v. patient-designated surrogates, $\Delta + 2\%$), our data provided ''positive'' evidence (Bayes factor = 14.3) that the effect size is smaller than 0.2. For the largest difference (families voting v. patient-designated surrogates, $\Delta + 4\%$), our data also provided ''positive'' evidence (Bayes factor[49] = 4.6) that the population effect size is smaller than 0.2.

2. Applying the majority rule (i.e., infer the preference that more than 50% of surrogates have inferred) to the surrogates' individual decisions resulted in 1536 simulated voting decisions. In 261 of these 1536 decisions of the voting groups (17%), the numbers of treatment and no-treatment votes were tied. Overall, the majority rule with a ''no-treatment'' default arrived at 50% treatment decisions, whereas the majority rule with a ''treatment'' default arrived at 81% treatment decisions. In the current study, in 53% of all cases the hypothetical patients preferred treatment. Not surprisingly, the majority rule with a treatment default yielded markedly worse overall accuracy, relative to the rule with the no-treatment default (64% v. 71% correct predictions). However, as the signal detection analysis shows, this result is not merely achieved through the no-treatment decision in case of a tie: Discrimination ability (i.e., the voting groups' ability to discriminate between treatment and no-treatment preferences, irrespective of response bias) was overall comparable to that observed for the other approaches—and, in fact, even somewhat better than that found for the other approaches in the more difficult mixed-preference scenarios.

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