Structural and Resource Determinants of Pharmaceutical Management Information Flow in Health Service Organizations

Don M Baridam and U N Uwaga

This study by Don M Baridam and U N Uwaga examines the extent to which structural and resource factors affect pharmaceutical management information flow (PMIF) in health service organizations (HSOs) in the eastern states of Nigeria. Fifty public and 35 private HSOs were surveyed using a composite rating scale — the Pharmaceutical Management Information Battery Scale.

Based on the data, the authors conclude that each component of structural and resource factors has a substantial, significant impact on PMIF.

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Most rational persons will rank good health highest in importance among the basic needs of man. This is because even good food cannot be beneficial to the body under certain conditions of illness and disease. As a corollary to these facts and considering the vital place of drugs and other pharmaceutical products in contemporary healthcare services, it is readily observable that adequate production and appropriate dissemination of pharmaceutical management information is vital to effective and efficient health service management and administration.

However, certain prevailing conditions and some recent events in the Nigerian Healthcare Delivery system suggest that the flow of pharmaceutical management information may be inadequate in the entire system. Incessant reports of drug stockouts, drug thefts, fake or counterfeit drug procurement and administration, conflicts between the health profession over drug prescriptions, interpretation and dispensing, irregularities in drug pricing and costs, drug hawking and drug abuse are all traceable in the final analysis to defects in the pharmaceutical management information system of Nigeria's national and state Healthcare Service Organizations (HSOs).

These problems seem to suggest that all is not well with the Pharmaceutical Management Information Flow (PMIF) in Nigeria's HSOs. The fact that these problems are generally associated with the less developed nations notwithstanding (Quick, 1982, pp 89-90), the responsibility remains with the researchers interested in the pharmaceutical industry to uncover the controllable factors which most influence or determine PMIF in any health service organization.

In every duly registered HSO operating in Nigeria, there is a pharmaceutical management information system with the general goal of capturing, processing, and causing to flow to needed decision points the information required to support sound pharmaceutical management decision. However, the prevalence of certain administrative and operational problems which seem readily traceable to possible defects in the PMIF
has no doubt hindered the attainment of the above goal. Indeed, professional pharmaceutical bodies operating in Nigeria have consistently complained about three aspects of their experiences in HSOs—the organizational structure, the resource situation, and information management which seem to affect the sound professional practice of pharmacy (PSN, 1988; Obowu, 1989).

Since information management is a powerful success factor in every organization today, and since pharmaceutical service subsector has grown very large, highly expensive, and socio-economically important, it is necessary to investigate the extent to which structural and resource factors affect management information flow in HSOs in Nigeria.

**Hypotheses**

Based on the objectives of this study, the following null hypotheses are formulated:

* There is no positive and significant correlation between the structural features of HSOs and PMIF.
* There is no positive and significant correlation between the resource elements of HSOs and PMIF.

**Organizational Structure and PMIF**

There can be very little doubt that organizational structure can hamper or enhance management information flow. This is particularly true of a healthcare service establishment (HSE) with its remarkable degree of professional diversity. In a typical HSE such as a hospital, there are bound to be diverse professional groups such as health service managers/administrators, physicians, pharmacists, dentists, health engineers/technologists, nurses, and other paramedical personnel. Without an adequate and practically logical organization design, the flow of pharmaceutical and other health information will suffer serious resistance.

In fact, in the healthcare delivery system of Nigeria today, role conflicts have already been reported between physicians and pharmacists over drug prescription and drug dispensing (Agbaje and Onyekwelu, 1991). Writing on behalf of the National Association of General Practice Pharmacists (NAGPP), Agbaje and Onyekwelu pointed out a structural flaw in the organization and operation of Nigeria's planned National Health Insurance (NHI) scheme. In the opinion of these authors, the NHI scheme, as proposed conferred the power to prescribe and dispense drugs on the physicians but with apparent implication of such inter-professional conflict for the smooth flow of pharmaceutical and medical communication in the interest of the entire scheme.

The Rivers State Chapter of the Pharmaceutical Society of Nigeria (Rivers PSN, 1989) and the national or parent body have also had cause to decry some structural weaknesses in the organization of pharmaceutical services in government health ministries and parastatals. Generally, these top professional bodies made the observation that pharmaceutical services, information flow, and decisions were bound to be ineffective and substandard under the present structural arrangement which leaves the pharmacist at non-management levels of the public healthcare management machinery.

Stanton (1981) indicated very clearly that there was a close relationship between management information flow and organization structure. Barros (1981) surveyed several types of management information systems and came to the conclusion that the structures of a good management information system had to match that of the entire organization if the flow of decision-relevant information within the organization was to be most efficient. He emphasized that there must be an integration of all the major sub-systems of the management information system to ensure an adequate degree of system reliability and performance. This attempt to integrate all sub-systems of an information system will inevitably lead to the integration of the sub-units of the organization into a reasonably well-coordinated corporate structure.

The degree of openness in communication between the professional and managerial personnel affects the structure of an organization. Diran (1978) found in a study of unsuccessful management system of an American University that such human factors as interpersonal communication flow and system acceptance level rather than technical characteristics of the system itself were closely related to the floundering of the MIS. The structure of an organization determines to a very large extent the pattern and intensity of information flow within the organization.

Nkereuwem's (1984) survey of the acquisition and use of technical information by Nigerian scientists and engineers in the oil industry revealed that interpersonal communication was the most popular means of diffusion of scientific and technical information in such a non-academic environment. It seems reasonable to assume that Nigerian physicians, nurses, dentists, pharmacists, and health service administrators themselves will tend to acquire useful scientific and technical information via oral communication than by dependence on their formal information media and systems. This calls for the design of the healthcare organization in such a way that interpersonal communication with the staff of the pharmacy department is facilitated. A healthcare
organizational structure which satisfies this condition will most readily ensure adequate flow of pharmaceutical management information.

Rowan (1982) discussed quite extensively the relationship between organizational structure and the flow of management and technical information in large computer-based management information systems. He noted particularly that the project-oriented design of the computerized information systems (CIS) department worked better than the function-oriented alternative to ensure a smooth flow of management information (pp 223-224). The project-oriented structure is designed around specific projects which the organization embarks upon.

Resource Dependence and PMIF

Information itself is most aptly recognized in present-day management philosophy as a special kind of organizational resource. Since information has to be available first before it can flow, it can be argued that an organization's information resource situation can produce a considerable impact on its management information flow. This view that information itself is a resource is shared by several writers. For example, Adenika (1985, p 275) has argued that in order to generate the flow of information on drugs and related public health issues, first, the responsible pharmacist has to be in possession of the required information.

Nwankwo (1985, p 49) argued that each element of an MIS costs money, and, therefore, the total cost of the proposed system should be weighed against the value of the information flow it will be capable of generating. This prescription implies that the cost of an MIS is necessarily related to the quality and quantity of information flow which it can generate. Nwankwo (1985) also recognized the importance of resources to the performance of an MIS. According to him, top management has to initiate and support the entire process of computer-based information system planning, installation, implementation, monitoring, evaluation, and adaptation to changing demands with financial and human resources. This responsibility of resource provision by top management seems immediately to justify the call by indigenous pharmaceutical companies in Nigeria for governmental resource contribution through patronage (Anyikwu and Ekezie, 1991, p 43). In particular, according to Anyikwu and Ekezie, the Nigerian pharmaceutical companies identify low capital base relative to their foreign competitors as one major source of their problems. It can be deduced from this complaint that the resource base of these companies' pharmaceutical management information systems is low and harmful to information flow in the systems.

Emovon (1989) noted that a computer-based information system requires three main forms of resources, namely, people, hardware, and software. Each of these resource forms costs money to procure and an information system's information flow performance will tend to be dependent on the quantity and quality of these resources at the owner organization's disposal. In fact, Emovon, in the same work, listed data barrenness and inability to pay for the required computer technology among the main causes for the slow pace of computerization by African organizations. It is a well-known fact that even data collected through surveys or experiments cost a good deal of money (Nsiah, 1976).

Purchasing and installing computers for pharmaceutical information management is highly desirable but this is not enough by itself. According to the Computer Association of Nigeria (1991), the computer-using enterprise still has to secure the services of computer professionals in the day-to-day operation and maintenance of their systems for best results. Since the average salary levels in the computer industry tend to be very high, securing experts to ensure system high performance will inevitably push up the overall cost of information production and flow in the organization in proportion to the quality and quantity of information flow desired.

Methods

Sample and Data Collection

The sample consisted of 85 high-ranking pharmacists in HSOs (both privately and publicly owned) in the eastern states of Nigeria. The confinement of the field work to eastern states and adjoining local government areas was based on the assumption that these were the states and local governments most likely to have HSOs spanning the full range of structure and resource characteristics intended for investigation in the study.

Personal interviews were held with two other high-ranking officers in each of the 85 organizations selected. They were mostly senior matrons, doctors, and health administrators. The purpose of this interview was to check and validate the responses given by the main respondents.

Instrument

A composite research instrument, the Pharmaceutical Management Information Battery Scale (PharMIB) was used for data collection. For a detailed description of the instrument, see Quick (1982).

Measures

The dependent variable, Pharmaceutical Information Flow was measured by the mean item score on the PMIF Scale (Part E of the PharMIB). PMIF = Total score in Part
The degree of adequacy of PMIF was measured on a 4-point scale ranging from very low (scored 1-point) to very high scored 4-points).

The independent variables were structural elements of the HSO and resource endowment. A determinant is a factor possibly with a significant (P = .05 at worst) potency for contributing to the observed status of an assumed dependent variable. For this study, structural determinants of PMIF include staff strength, locational plurality, number of authority levels, authority status of chief pharmacists, presence of pharmacists in the department, departmental viability of medical records, inter-professional communicative cooperation, and inter-organizational communication linkage.

A factor which was a resource element was called resource determinant. Resource determinants were measured in part D of the PharMIB. These included consumable supplies, physical facilities, funds, data, and personnel. They also included the wealth of modern analytical management decision and service techniques or machines with which the HSO was endowed. The adequacy of each resource factor was measured on a 5-point scale.

### Results

Table 1 presents the Pearson Product Moment Correlation between the structural elements and the PMIF.

The results show that for the combined population of HSOs, only one structural factor, namely, inter-professional communication, was significantly and positively correlated with PMIF.

For the public population of HSOs, the only structural factor which was found significantly correlated with PMIF at the .05 level of significance was the number of authority levels, i.e., structural height. This factor correlated directly with PMIF.

However, when the private HSOs were considered apart, two structural factors emerged as those positively and significantly correlated with PMIF (p < .001). These were inter-professional communication and inter-

<table>
<thead>
<tr>
<th>Item No</th>
<th>HSO Structural Element</th>
<th>Public or Private HSOs (N=50)</th>
<th>Public HSOs (N=50)</th>
<th>Private HSOs (N=35)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Staff strength</td>
<td>.032</td>
<td>.411</td>
<td>.127</td>
<td>NS</td>
</tr>
<tr>
<td>11</td>
<td>Locational plurality</td>
<td>-.128</td>
<td>-.105</td>
<td>-.149</td>
<td>NS</td>
</tr>
<tr>
<td>12</td>
<td>Number of authority levels</td>
<td>.110</td>
<td>.300*</td>
<td>-.108</td>
<td>S in public HSOs</td>
</tr>
<tr>
<td>13</td>
<td>Authority status of chief pharmacist</td>
<td>.148</td>
<td>.530</td>
<td>.431</td>
<td>NS</td>
</tr>
<tr>
<td>14</td>
<td>Presence of pharmacists at department</td>
<td>.142</td>
<td>.176</td>
<td>.199</td>
<td>NS</td>
</tr>
<tr>
<td>15</td>
<td>Departmental viability of medical records</td>
<td>.253</td>
<td>.181</td>
<td>.135</td>
<td>NS</td>
</tr>
<tr>
<td>16</td>
<td>Inter-professional communication</td>
<td>.614*</td>
<td>.331</td>
<td>.652</td>
<td>Sin combined and private HSOs</td>
</tr>
<tr>
<td>17</td>
<td>Inter-organizational communication linkage</td>
<td>.422</td>
<td>-.082</td>
<td>.705</td>
<td>S in private HSOs</td>
</tr>
</tbody>
</table>

- = P < .05; ** = P < .01; *** = P < .001.

NS = Non-significant (Correlation); S = Significant (Correlation).

+ = Combination is of academic interest only since some factors have highly differential potencies across the sectoral groups of HSOs.
organizational communication linkage. Hence, not all of the structural factors failed to attain a significant level of correlation with PMIF. The null hypothesis was rejected at the 5 per cent level of significance. The inference was then drawn that structural factors, namely, number of authority levels, inter-professional communicative cooperation and inter-organizational communication linkage positively correlated significantly with PMIF in HSOs.

Table 2 presents the results of the second hypothesis that there is no significant correlation between resource elements of HSOs and PMIF.

The results show that two resource factors, namely, availability of special equipment and annual budget size were found to be significant correlates of PMIF for all groupings of the HSOs: combined, public or private (p<.01). It is also striking that no other factor proved to be a significant correlate of PMIF in the private sector.

For the combined HSOs, availability of infrastructural facilities (r=.75, p<.001) and wealth of medical library (r=.71, p<.001) also emerged as significant correlates of PMIF. It is, therefore, reasonable to hypothesize that health service resource factors do correlate positively with PMIF (especially in the private sector HSO).

### Discussion and Conclusions

The null hypothesis that structural factors would not correlate significantly with PMIF was rejected since some of the factors proved to be significantly correlated with PMIF.

The hierarchy of authority levels in the public sector HSOs carried an implication for the nearness of the chief executive to the highest office, namely, the Commissioner of Health. Hence, the taller the structure of a public sector HSO, the nearer the top executives are to the pinnacle of power in the state healthcare system and, hence, the more serious the staff will tend to be in handling PMI. This greater seriousness on the part of the

<table>
<thead>
<tr>
<th>Item No</th>
<th>HSO Resource Element</th>
<th>Public or Private HSOs (N=85)</th>
<th>Public HSOs (N=50)</th>
<th>Private HSOs (N=35)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Consumption supplies level</td>
<td>.293</td>
<td>.02</td>
<td>.525**</td>
<td>S in private HSOs</td>
</tr>
<tr>
<td>19</td>
<td>Availability of infrastructural facilities</td>
<td>.749***</td>
<td>.49</td>
<td>.814***</td>
<td>S in private HSOs</td>
</tr>
<tr>
<td>20</td>
<td>Availability of special equipment</td>
<td>.692**</td>
<td>.451**</td>
<td>.878***</td>
<td>Sin all private or public HSOs</td>
</tr>
<tr>
<td>21</td>
<td>Internal cash flow</td>
<td>.212</td>
<td>.245</td>
<td>.538**</td>
<td>S in private HSOs</td>
</tr>
<tr>
<td>22</td>
<td>Annual budget size</td>
<td>.514**</td>
<td>.500**</td>
<td>.912***</td>
<td>Sin all private or public HSOs</td>
</tr>
<tr>
<td>23</td>
<td>Wealth of medical library</td>
<td>.712***</td>
<td>.115</td>
<td>.656**</td>
<td>S in private HSOs</td>
</tr>
<tr>
<td>24</td>
<td>Professional staffing position</td>
<td>.356</td>
<td>.91</td>
<td>.528**</td>
<td>S in private HSOs</td>
</tr>
<tr>
<td>25</td>
<td>Analytical methods and computers</td>
<td>.319</td>
<td>.010</td>
<td>.881***</td>
<td>S in private HSOs</td>
</tr>
</tbody>
</table>

+ Academic only; * = p < .05; ** = p < .01; *** = p < .001.

S = Significant (correlation with PMIF).
staff may be the result of fear rather than of high job satisfaction. The shorter the structure of the public sector HSO, the farther from powerful superordinates it is likely to be and, hence, the lower the level of seriousness among staff in PMI handling. These situations explain the significant positive correlation between number of authority levels and PMIF. A comparison, for example, of Braithwaite Memorial Hospital, which is a high class State General Hospital with a state-owned "cottage hospital" in a village setting will make clear why levels of authority can seriously influence the performance level in PMIF.

Inter-organizational linkages for communication and inter-professional cooperation through free communication correlated very highly with information flow. This seemed to be a positive use of the links to generate and utilize PMIF.

On its part, inter-professional communicative cooperation implies that the non-pharmacists in the establishment freely request PMI and the professional pharmacists also freely oblige by providing the needed information from external or internal sources (Adenika, 1985).

The test of hypothesis two revealed that staff strength, number of authority levels, authority status of the chief pharmacist, and linkage and communicative cooperation between professionals were strong contributors to PMIF performance.

These significant results can be explained readily. The larger the size of an organization, the more difficult it becomes to observe a good level of performance in its PMIF (Stanton, 1981). This situation arises because of the increased number of decision points and the increased risk of information flow resistance through editing, sub-editing, and even filtering.

The outcome of this test also shows that inter-professional cooperation is a strong contributor to PMIF in the private sector HSOs only. The reason seems clear: health professionals in the private sector are very concerned about cordial interpersonal and public relations which together constitute the backbone of their cherished success in the contemporary world of business (Nwachukwu, 1988). In the governmental HSOs, on the other hand, discriminatory pay policies and such other unpleasant personnel practices precipitate inter-professional strife rather than cooperation.

The test of the second hypothesis reveals that in the private sector HSOs, all the investigated resource factors are highly correlated with PMIF in the private sector whereas budget size and special equipment are the significant predictors in the public sector.

The relationships can be explained generally by observing that resource elements such as those listed enable the HSO to acquire and manage PMI effectively. For example, a large enough annual budget size for pharmaceutical services implies that the HSO is able to hire computer personnel, buy, and install computers on their advice, and operate a really effective PMI system.

The failure of resource factors other than budget and equipment to attain significance in public HSOs can be explained by noting that these factors tend to be centrally controlled on the basis of socio-political rather than rational considerations (Gish and Feller, 1979). In the private sector, many different proprietors or owners are involved in the healthcare service business. They have varying strengths, are resource based and have access to business capital, and, therefore, the resulting PMIF levels in their HSOs also vary correspondingly. This phenomenon is all that the correlation indicates: patterned covariance between two associated series of values of two variables (Levin, 1984).

Infrastructural facilities clearly become necessary as special rooms have to be provided for computers and their accessories in good pharmaceutical management information system. The significance of special equipment becomes clear when it can be seen that calculators, telephones, radio, and television sets for use in organizational communication are special equipment bound to enhance PMIF where they exist and are put to effective use.

The budget size factor stands out again since all other resources can be purchased or hired with financial resources. Professionals contribute a lot to making the pharmaceutical management information system work. They design the system for optimal performance, collect and analyse data into information, prepare reports, communicate them and monitor or evaluate system performance (Andrus, 1976).

The potency of "analytical methods on computers" should be clear since these methods and the computer are basically the active force in modern information technology (Emovon, 1989).

From the above discussion, one can readily conclude that structural and resource factors are important determinants of PMIF in the health service organizations in Nigeria. These findings have two major implications. First, management must design a structure that will allow a free flow of pharmaceutical information. Second, there must be generous funding and better equipment in the health service system in order to have an adequate flow of pharmaceutical management information.
References


